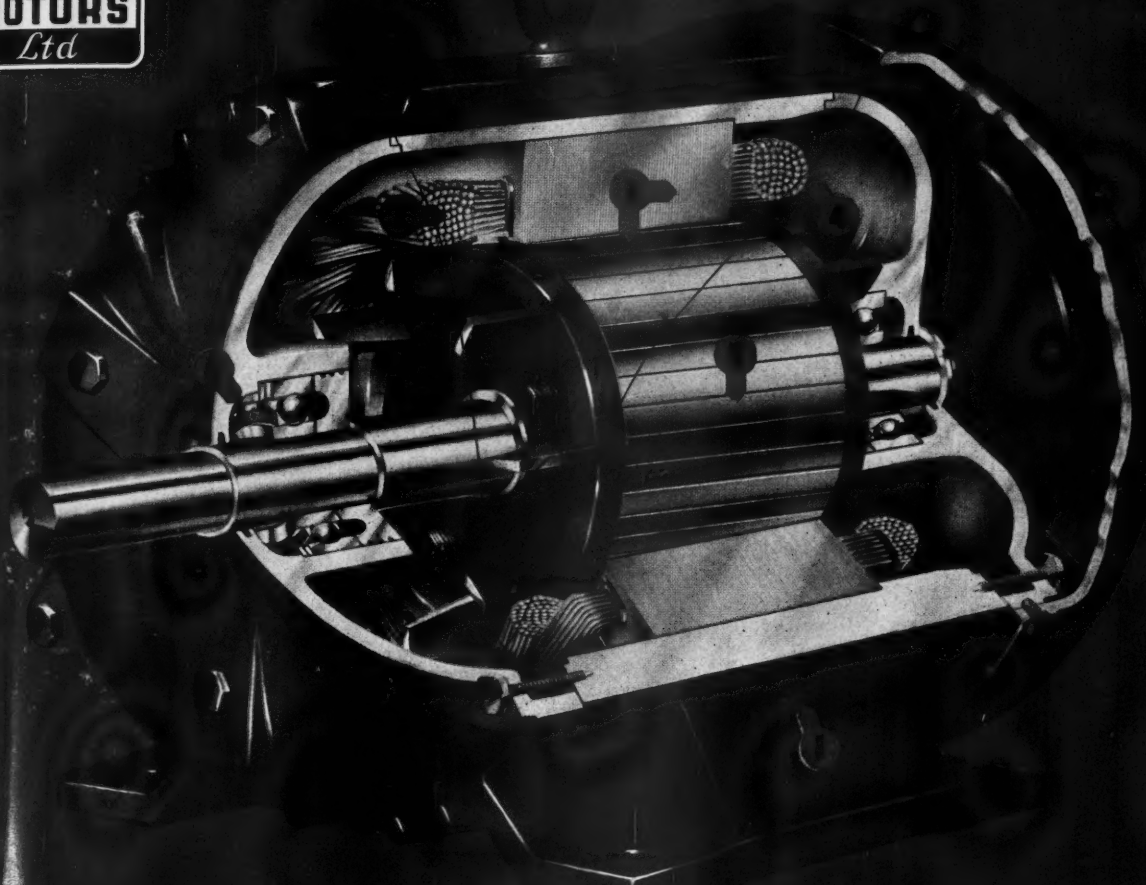
ELECTRICAL REVIEW

BROOK MOTORS Ltd

Built for Reliable Power



1. **STATOR FRAMES.** Of stout cast iron, resilient to shock and not subject to deformation under heavy load.

2. **WINDINGS.** The phenolic resin wire covering combines the qualities of toughness and flexibility with imperviousness to attack from impregnating fluids.

3. **LAMINATIONS.** Long experience in slot and tooth design gives the best electrical balance between magnetic and non-magnetic materials.

4. **ELECTRICAL VARNISH** used in Brook motors gives protection from the action of many corrosive acids and active gases.

5. **ROTOR** design can vary according to special needs, such as intermittent or continuous overloads, heavy starting or shock loads, silence.

6. **BEARING LUBRICATION.** Ample grease is packed into the motor bearing housings to last for a considerable time.

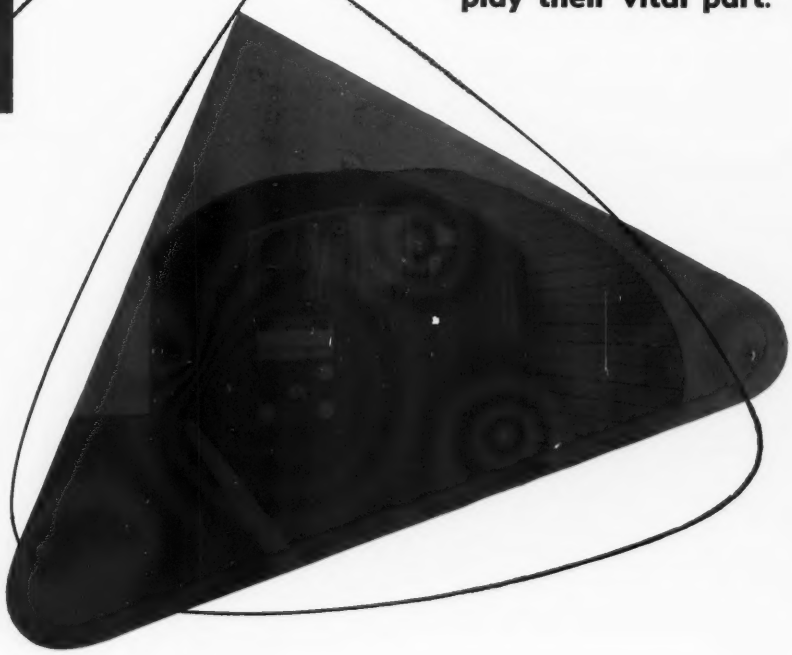
LOOK inside a BROOK motor – see why it gives more power and longer life

above and below ground

Our insulating materials play their vital part.

m and i

the electrical insulation people



TOP PHOTO By Courtesy of C.E.A.
LOWER PHOTO By Courtesy of London Transport Executive

THE MICANITE & INSULATORS CO. LTD., WALTHAMSTOW, LONDON, E.17
Telephone: Larkswood 5500 Telegrams: Mytilite, Easphone, London

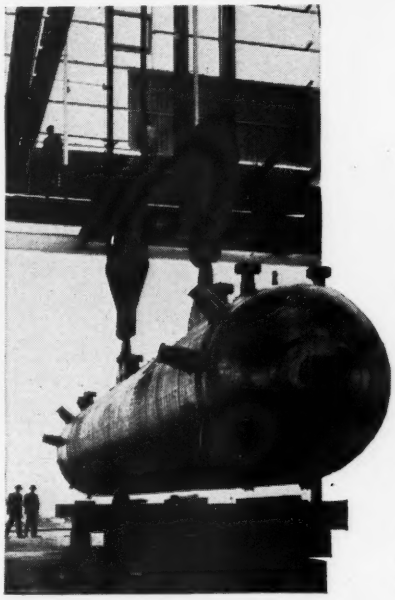
Largest boiler units operating in Europe are

BABCOCK

We are exhibiting at the
Engineering, Marine, Welding & Nuclear Energy Exhibition
Olympia, London
29th August – 12th September, 1957
Grand Hall, Ground Floor, Stand No. 4, Row G.

Castle Donington power station, now feeding into the 132 kV Grid will also feed into the 275 kV Supergrid.
Left: View into boiler furnace during erection.

Below: Lifting one of the boiler drums, weighing 90 tons, to a height of 123 feet.



830,000 lb. per hr./100 MW units at Castle Donington

CASTLE Donington (C.E.A., East Midlands Division), is the first power station in Europe with single boiler/turbine units of 100 MW rating and its boilers are the largest in operation in Europe.

Ultimately there will be six pulverized-fuel-fired, twin-furnace, Radiant-type boilers each with a capacity of 830,000 lb./hr. M.C.R., supplying steam at 1,600 lb./sq. in. and 1060°F. The coal-handling plant serving this installation is the largest in Britain, with a designed capacity of 960 tons/hr.

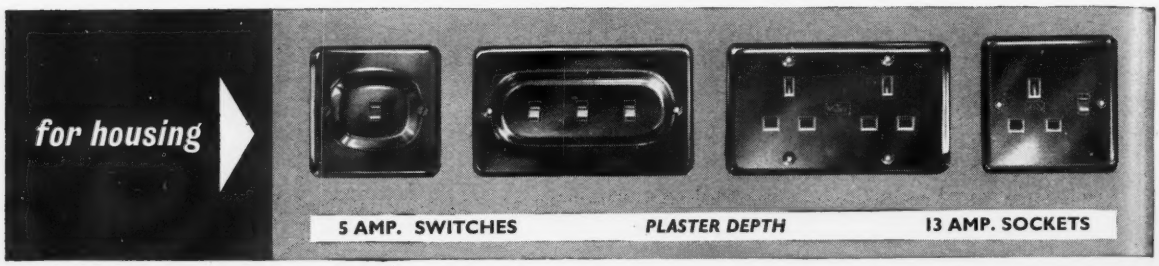
The whole of the boiler plant, including the thirty type-E coal-pulverizing mills and the entire soot-blowing installation, the coal-handling plant and the 'Hydrojet' and 'Hydrovac' ash and dust-handling systems, are of BABCOCK design and manufacture.

The Company has subsequently received orders for boilers of twice this capacity, to steam 200 MW generators, and is engaged in the design of even larger units. Such is the progress of technical development—but always with BABCOCK in the front rank.

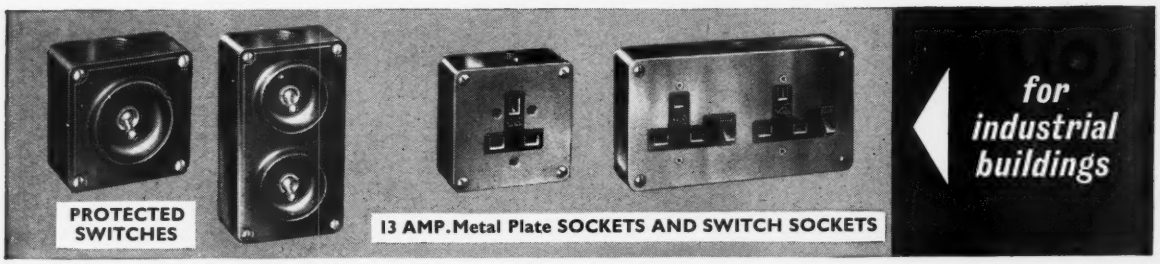
BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, LONDON, N.W.1

A

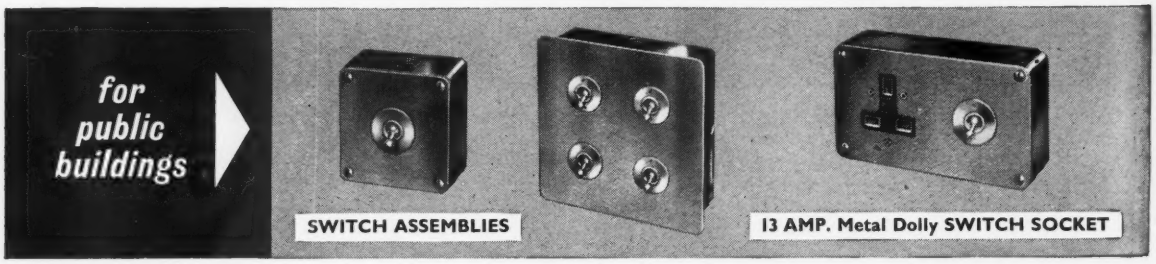
Volex makes the point...



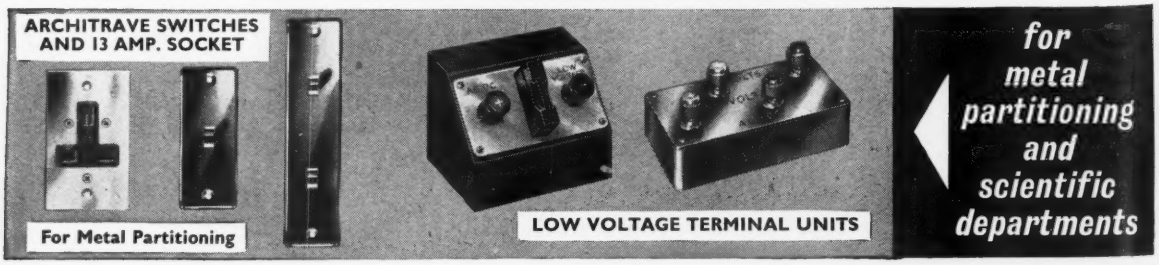
... used by Public Authorities and Government Bodies



... specified by Architects and Consultants



... approved by Contractors everywhere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For Metal Partitioning
LOW VOLTAGE TERMINAL UNITS
for metal partitioning and scientific departments

For further details send for 1957/58 Edition Catalogue.

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SALFORD 6

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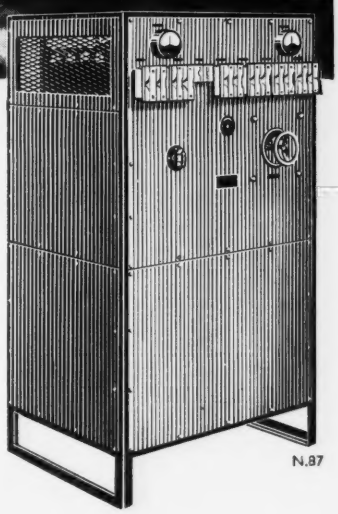
They never let you down

THE ROYAL NATIONAL LIFEBOAT INSTITUTION

Perhaps the greatest of British charities, this famous institution was founded in 1824, and by the time its second report was published had already contributed to the saving of 342 lives. By 1924—centenary year—it had given awards for the saving of nearly 60,000 lives and today that figure stands at over 78,000. At this very moment, all along our coastline, 154 lifeboat crews are ready for the emergency call which means that someone is in peril on the sea. They never let them down.



YOU CAN BE CERTAIN TOO that Nife-Neverfayle Emergency Lighting Equipment will never let you down. *Whenever* needed, these reliable units will instantly, automatically spring into action. That is the special advantage of the Nife Steel Alkaline Battery—it never deteriorates, even after long periods of inactivity.

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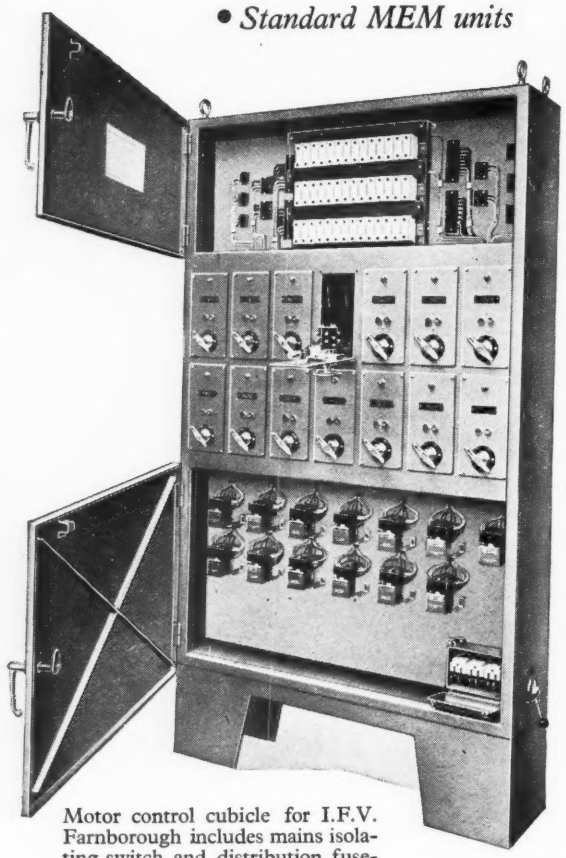
THE EMERGENCY LIGHTING EQUIPMENT WITH THE **STEEL** ALKALINE BATTERY

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

Let MEM quote for the panel too

• *Standard MEM units* • *Compact design* • *Easy maintenance*

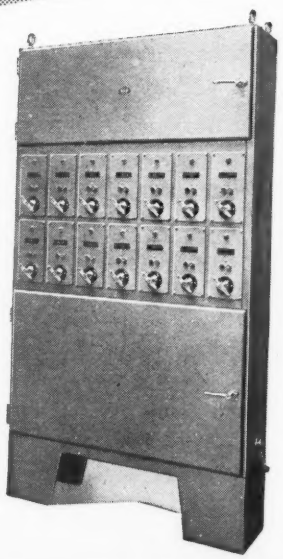


Motor control cubicle for I.F.V. Farnborough includes mains isolating switch and distribution fuseboard feeding thirteen starters via rotary switches.

DO YOU KNOW that MEM have a large department which specialises in L.T. switchboards? Many of Britain's leading industrial concerns and institutions come regularly to MEM for their switchboards. The reasons are simple. MEM switchboards for the most part include standard MEM Switchgear, Fuseboards, Bus-Bar Chambers and Motor Control Gear. These are proved all over the world, simple, robust and easy to maintain.

You also get excellent engineering service from MEM whose staff of experts is always ready to help in designing your panels.

When your next switchboard comes up, be sure to ask MEM to quote.



Closed view of motor control cubicle for I.F.V. Farnborough.

Installed by Ministry of Works on behalf of Ministry of Supply.

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Switch, fuse and motor control gear, electric fires and localised lighting equipment

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SWITCHBOARD DIVISION

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BRANCHES IN LONDON AND MANCHESTER.

. . . tough indeed, for they have to lead a tough life, nosing into corners wherever dust is lurking, yet never bruising cherished furniture nor marking bright, new paint.

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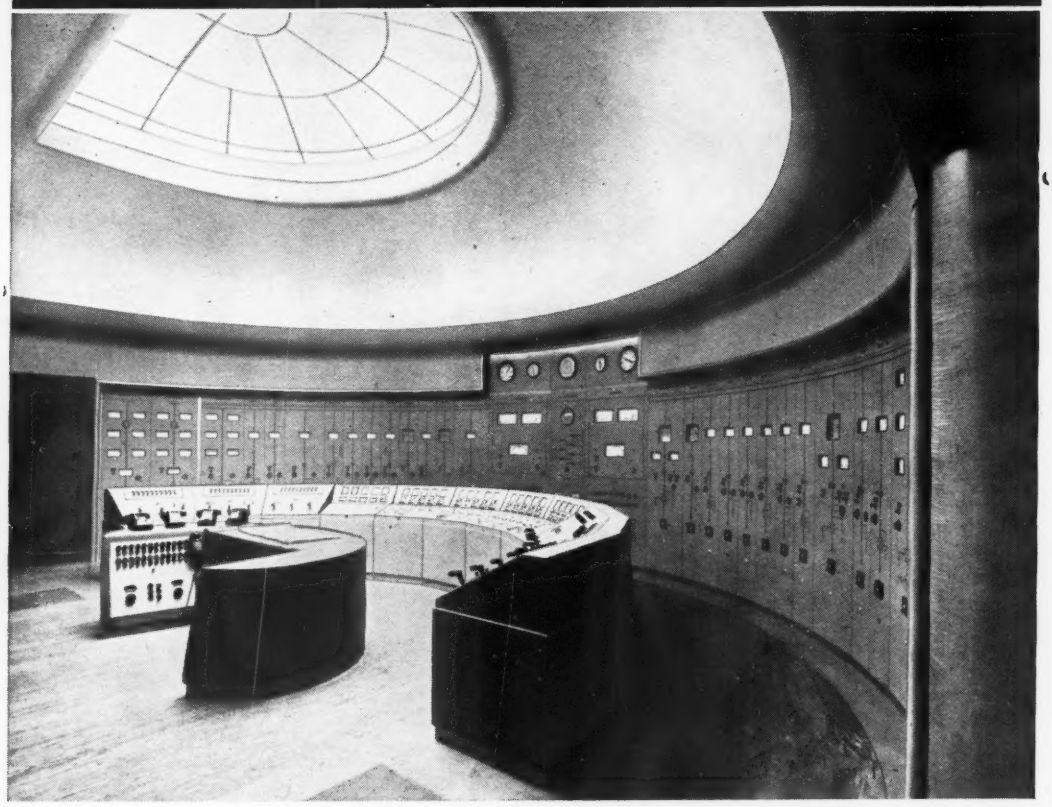
CONTROL-BOARDS BY REYROLLE



Power-station corridor-type control-board for generators, transformers, and feeders, with generator control-desk and control-engineer's logging-desk in the foreground

specialists in switchgear and control-apparatus

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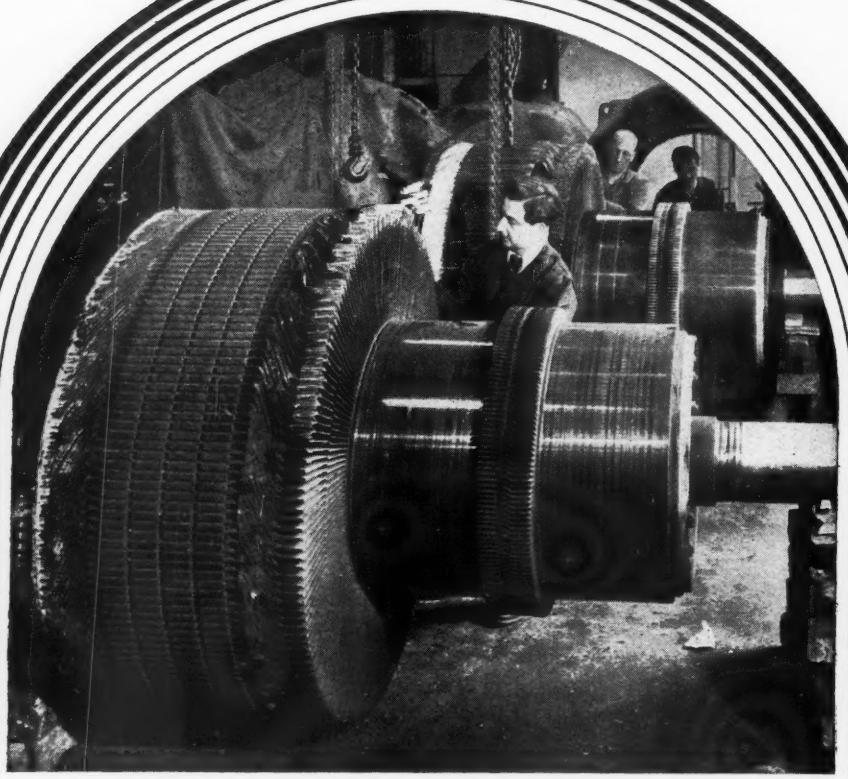

Engineers' Language! For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

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MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

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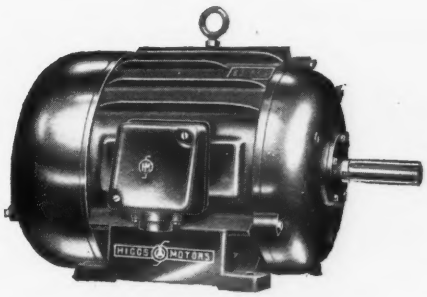

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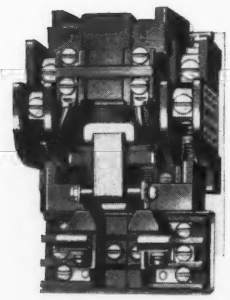
A.C. POWER RELAYS

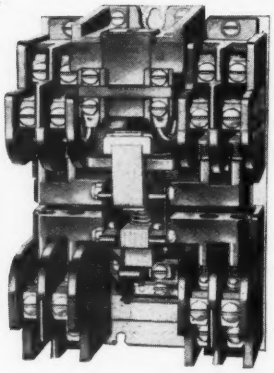
WITH 2-4 OR 8 POLES

Any pole can be supplied "Normally-open" or "Normally-closed"; double-break main contacts rated at 10 amps. 550-volts maximum. One or two auxiliary change-over contacts can be added in addition to main poles. Tractive coils available—6 to 550-volts A.C.

The relay, when open style, is supplied with back fixing plate suitable for mounting on insulation or steel panels, or in metal cases.



● 2-pole Open Style Relay with two changeover coil circuit contacts.



● 8-pole Open Style Relay with one changeover coil circuit contact.

● 4-pole Enclosed Relay.

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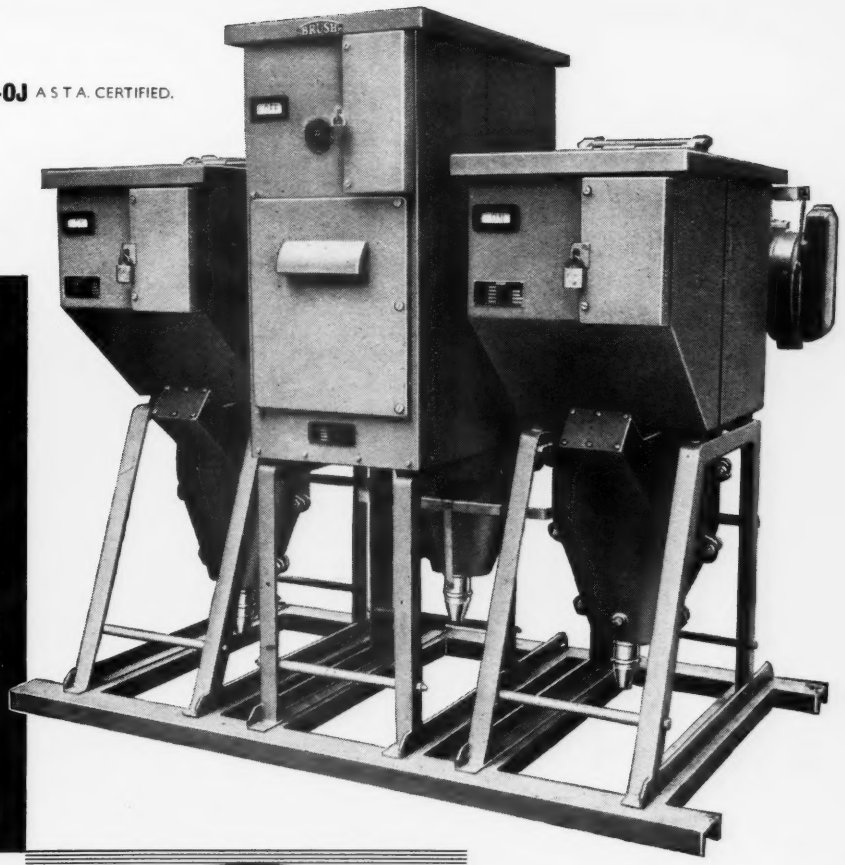
TYPE HF-OJ A.S.T.A. CERTIFIED.



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extensible

OUTDOOR RING-MAIN UNIT

incorporating Switch-Fuse Unit with fuses in air

- *Air-insulated fuses.*
- *A.S.T.A. certified at 6.6 kV and 11 kV up to 250 M.V.A.*
- *Fully interlocked.*
- *Speed of operation independent of operator.*
- *Facilities for cable testing.*

The Brush extensible HF-OJ outdoor unit is intended for ring-main application and embodies two oil-switches and a high voltage switch-fuse which provides an economical solution for the control and protection of tee-off feeders and transformers.

Full information covering the component equipment of the Unit is contained in our Publications 41016/14/17.

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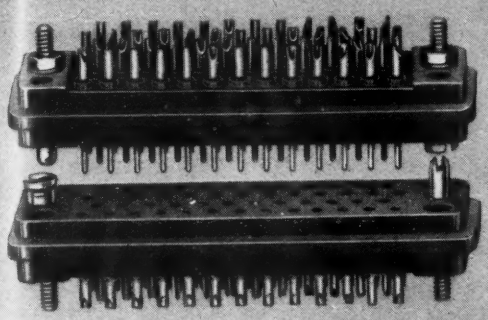

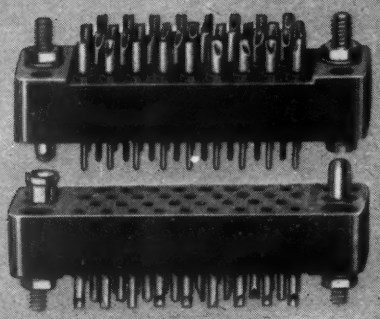

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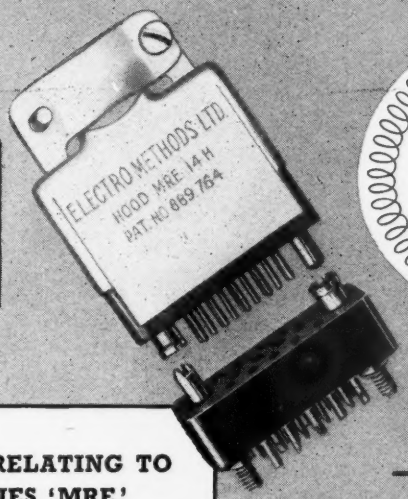

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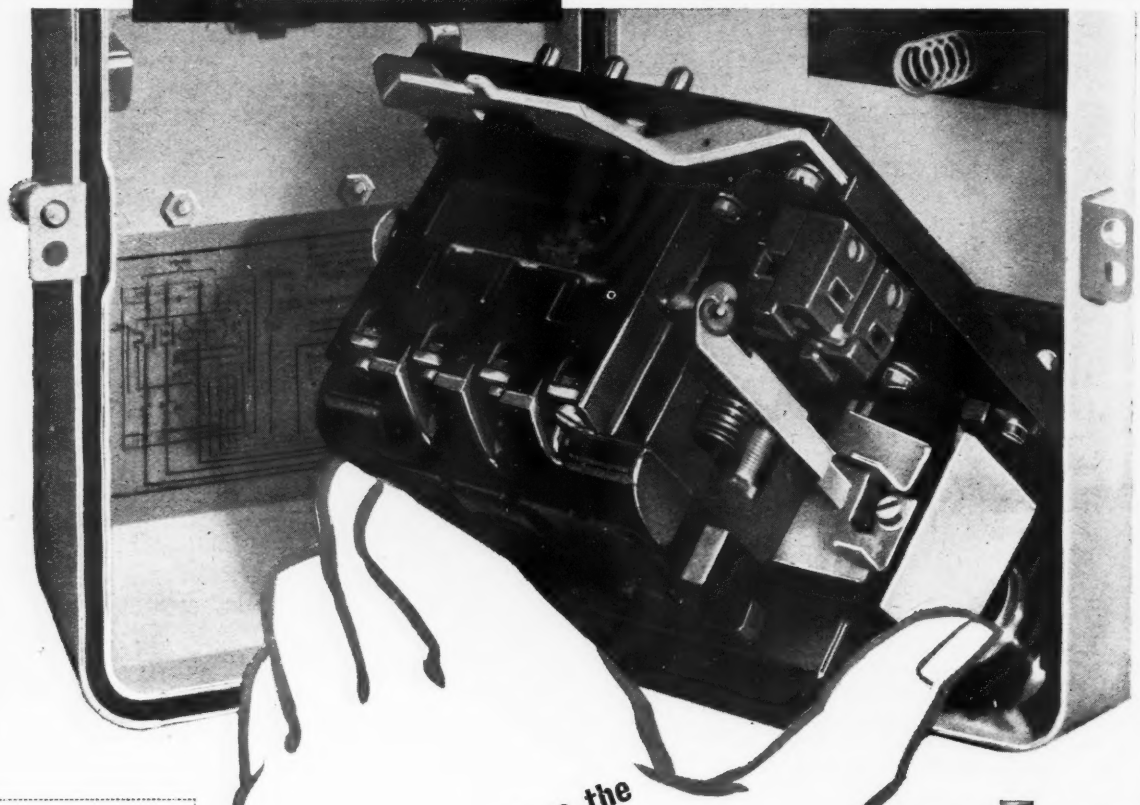
TYPE 616

THE BROOKHIRST PLUG-IN STARTER



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To remove or replace the interior unit of the BROOKHIRST 616 STARTER is a matter of seconds . . .

. . . the front-connected block contactor and overload relay are mounted on a moulded panel having plug-in isolating contacts secured to its underside. Withdrawal entails no more than releasing a retaining clip; no tools required; no trailing cables to disconnect. The 616 starter is ideal for applications demanding continuous running. Suitable for 3-phase squirrel cage motors up to 7½ H.P. 550 V. Full details in Leaflet 1800.

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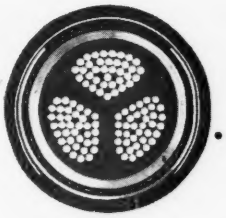

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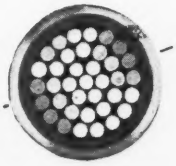

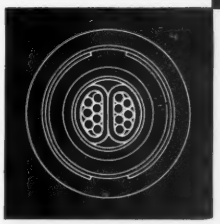

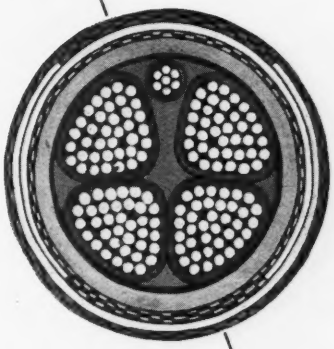

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BARE AND INSULATED ELECTRICAL CONDUCTORS OF ALL TYPES

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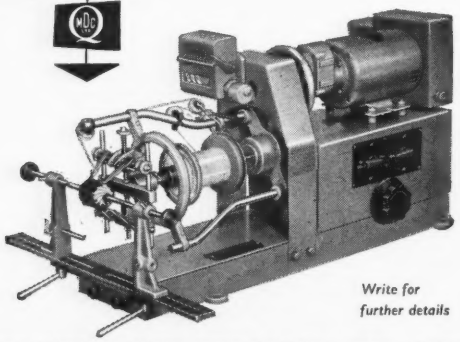

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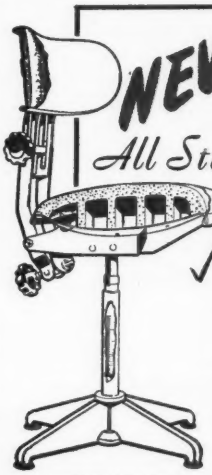

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- Back Rest adjustable for height and angle.
- Pressed steel seat pan with Latex Foam interior and cover with "Lip-Grip" bead (Pat. applied for)
- Oil immersed centre screw and self-lubricating bush in the seat pillar gives longer life, finer adjustment to seat height, is self-lubricating and non-squeaking.

FEATURES THAT ADD UP TO "COMFORT PLUS"— AND A LONG TROUBLE-FREE LIFE

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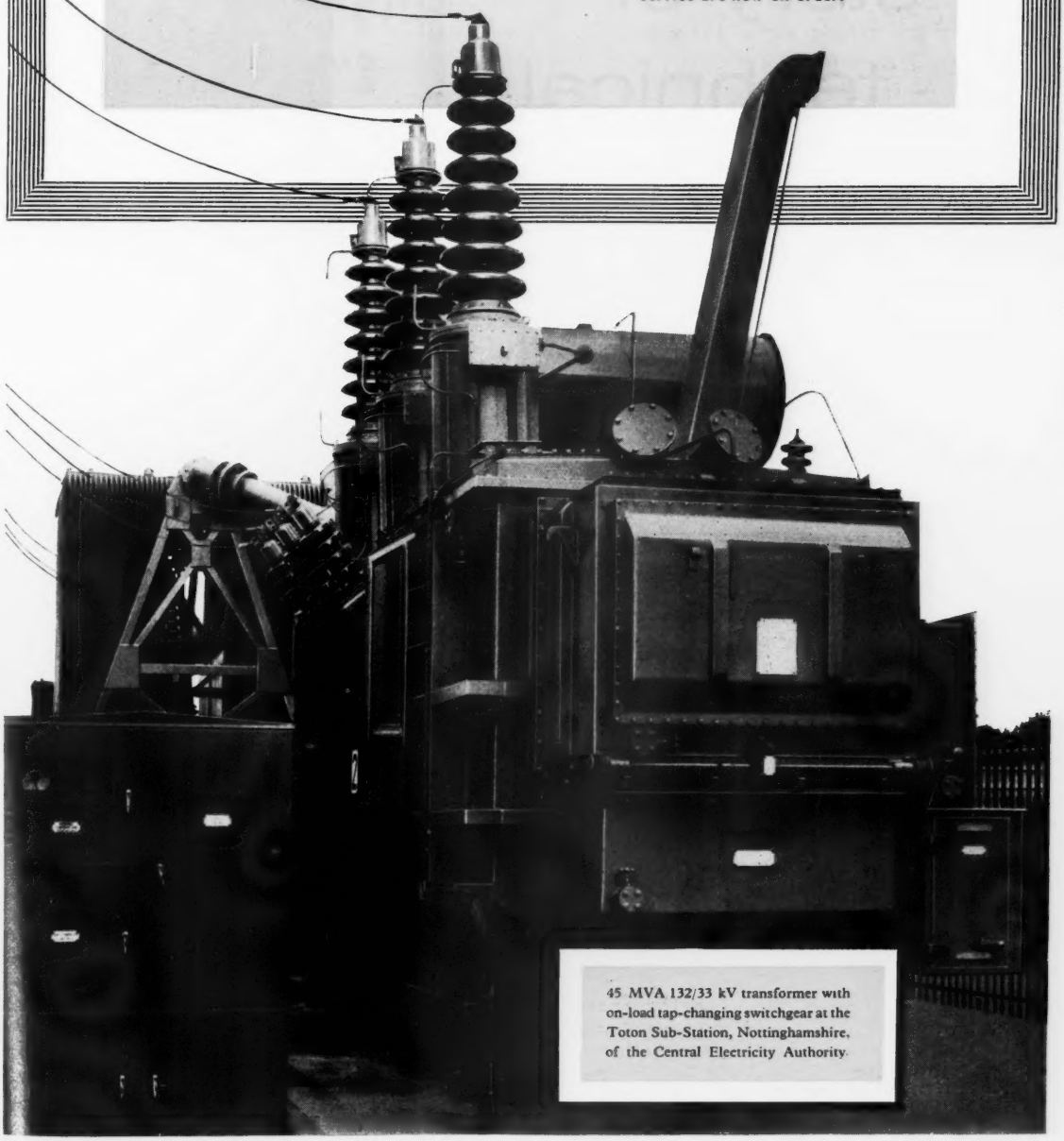

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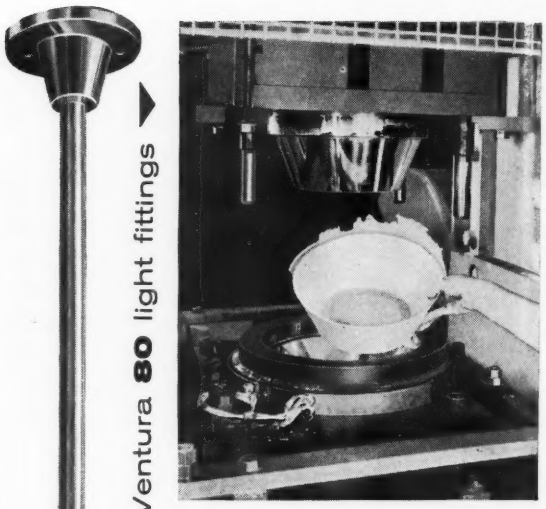
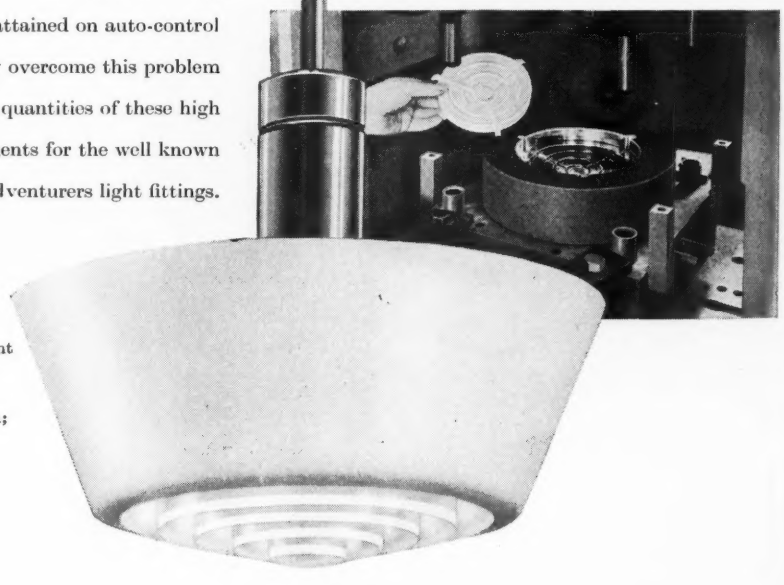


moulding the Ventura **86** light fittings

The fitting is made in two parts. The body weighing nearly ½ lb., is moulded in opalescent Beetle urea material from a single impression tool in a Type 200 BIPEL press

The louvre, weight 3¼ ozs., is made from Beetle semi-translucent urea material. It is moulded from a single impression tool in a BIPEL Type 100 press



The Ventura 86 tubular pendant type. There are three other types, the basic type, the ceiling and the flex suspension; all incorporate the same diffuser and louvre units, moulded by Streetly

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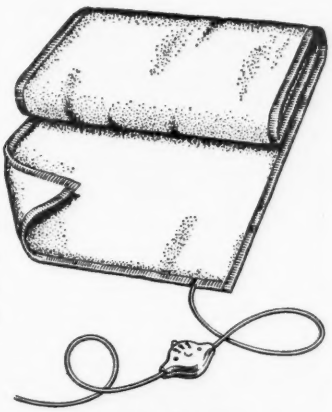

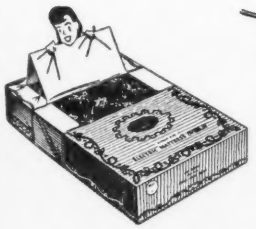

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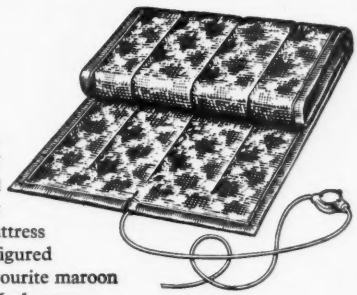

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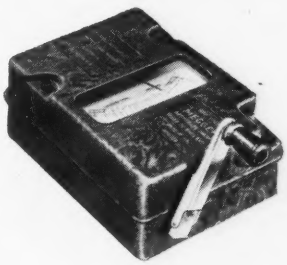

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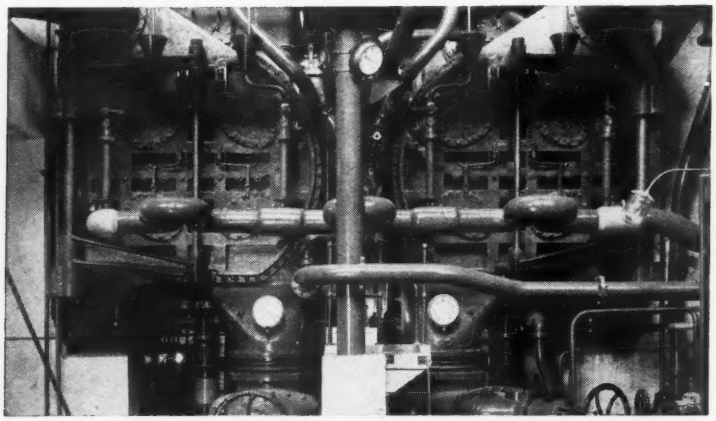

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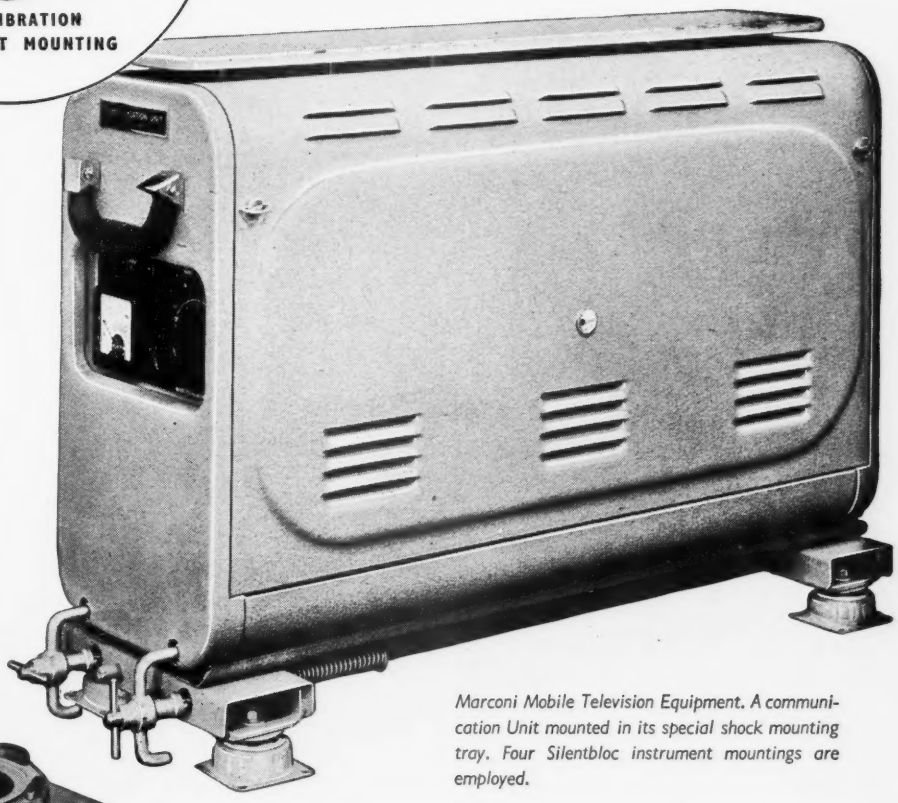

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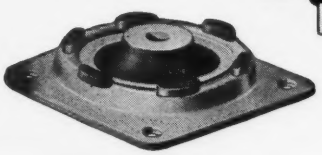

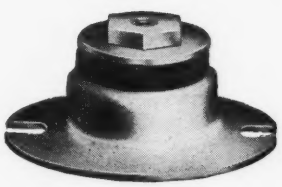

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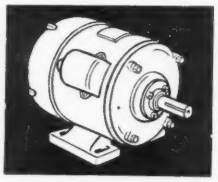

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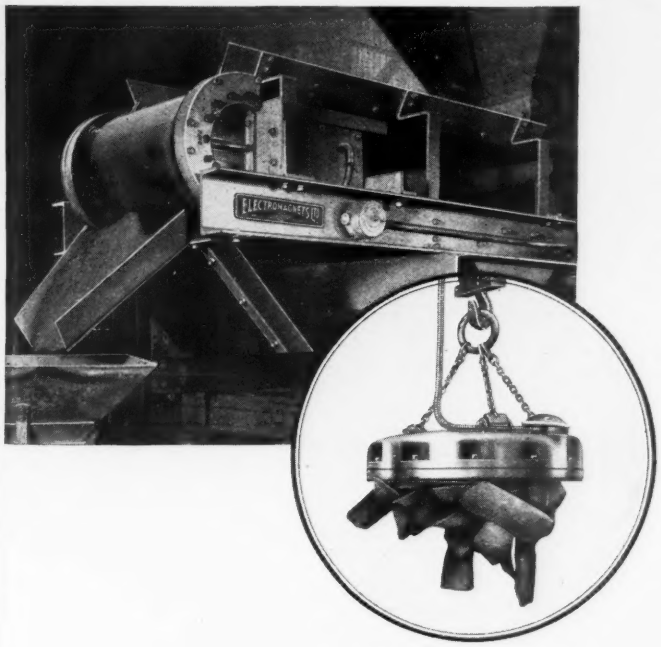

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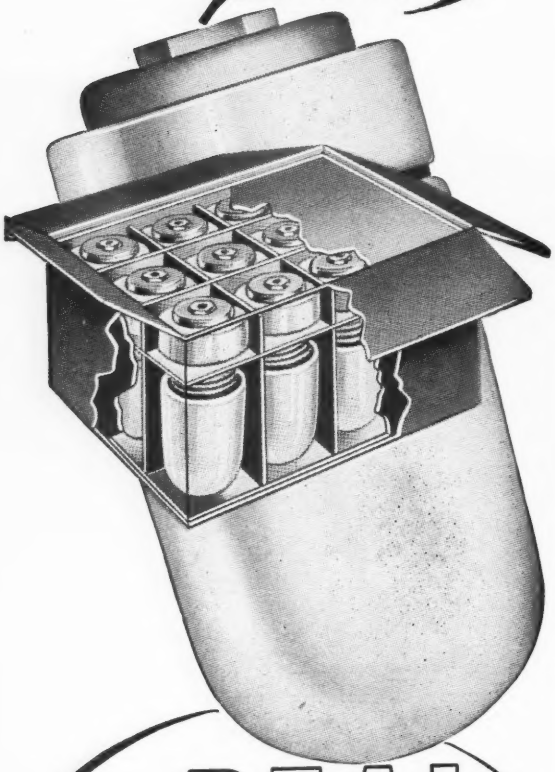

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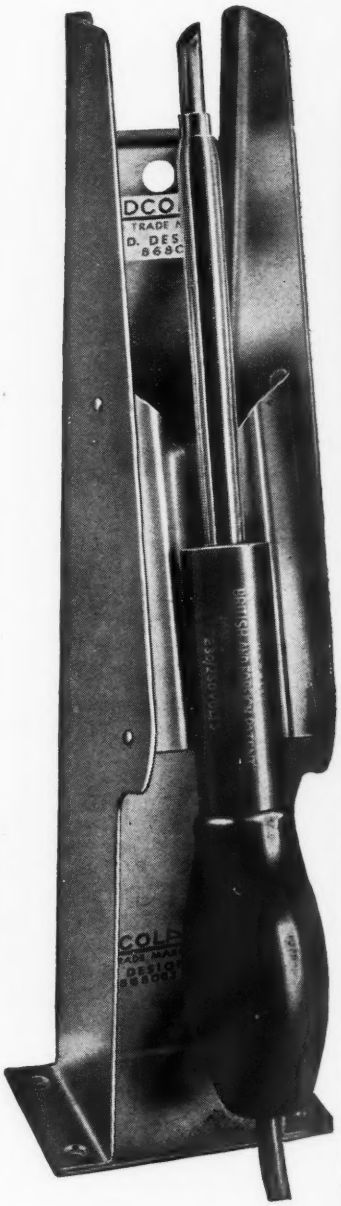

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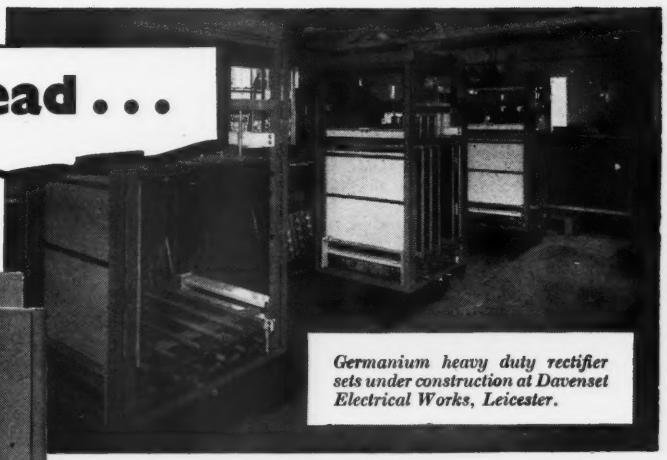

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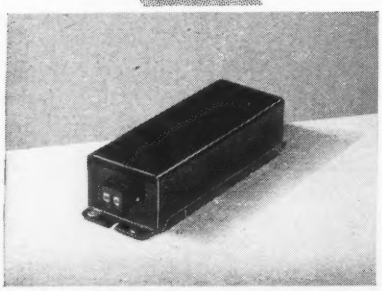

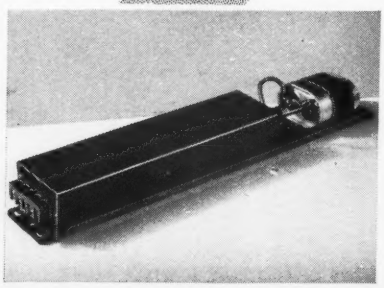

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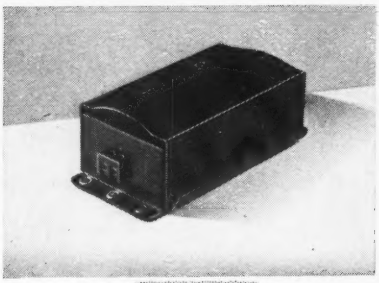

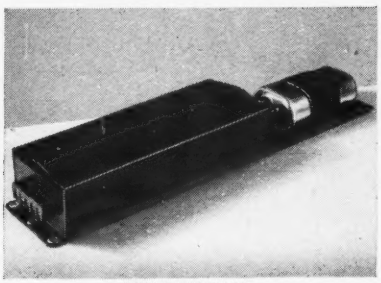

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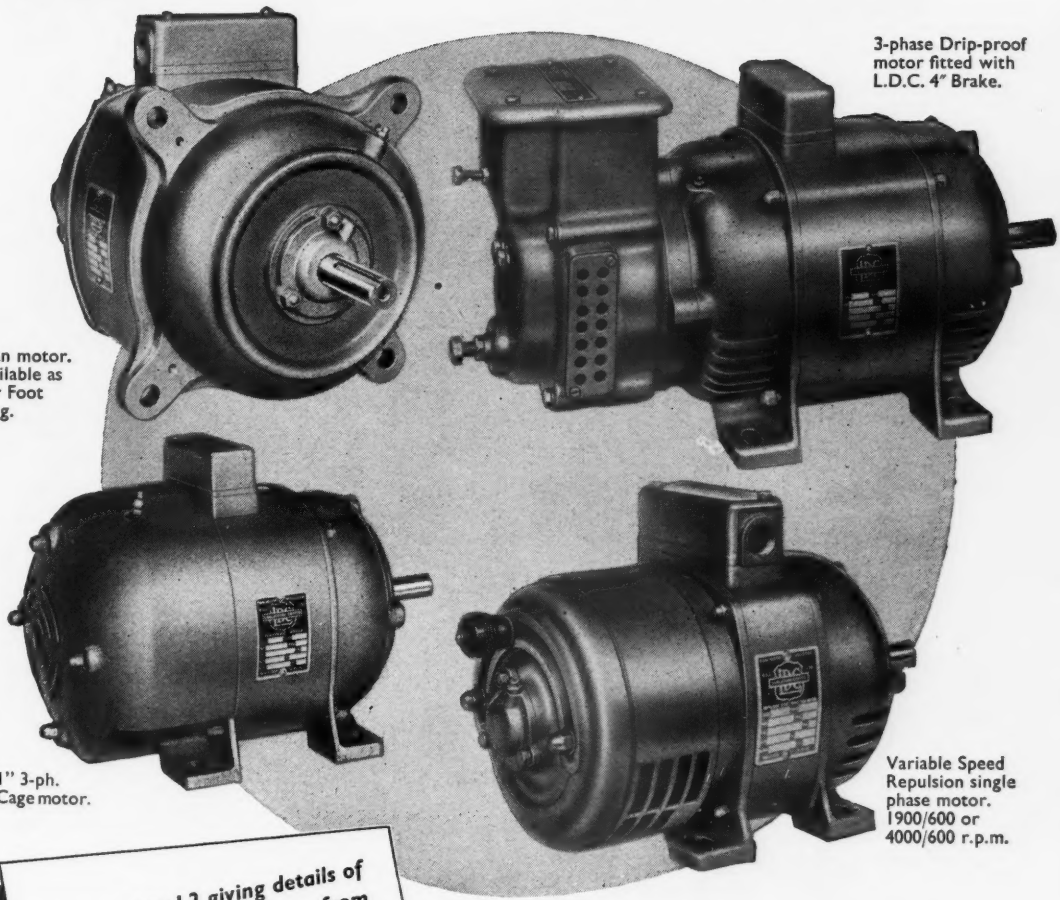

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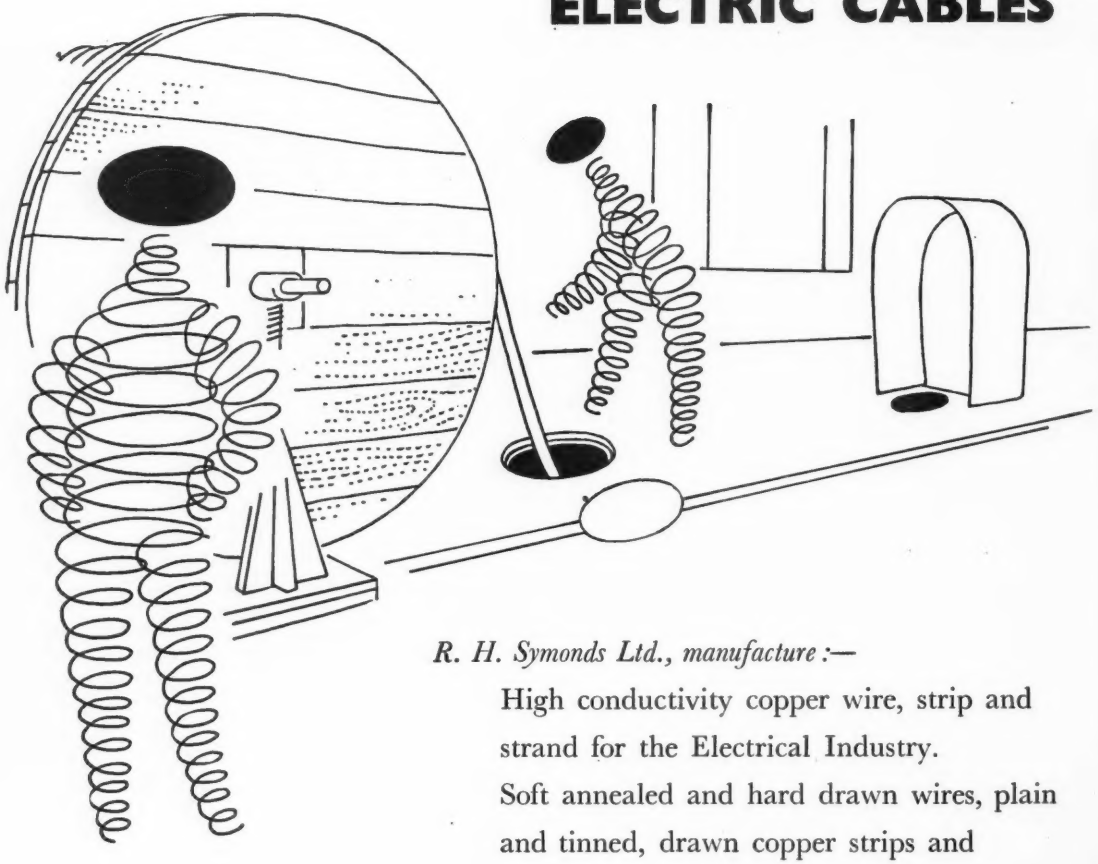

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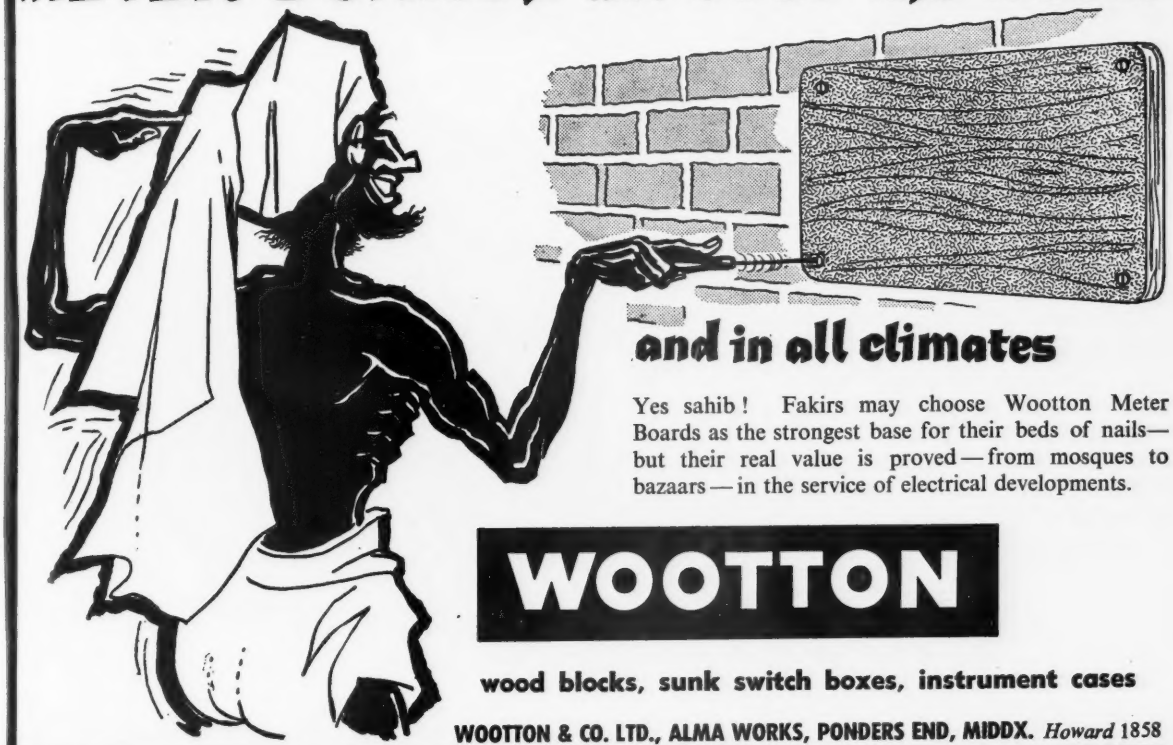

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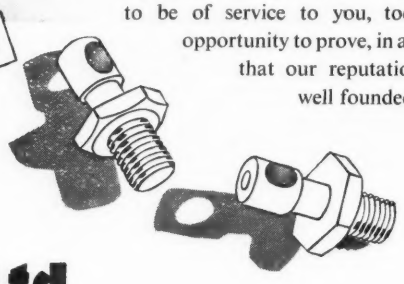

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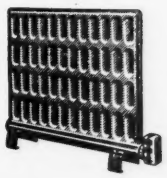
The famous 'Dimplex' permanently oil-filled thermostatically controlled electric radiators. Big range of models, ½ — 2 kw. Eight colours.

Write, too, for details of the new Dimplex Junior Model.



FOR SHORT TERM HEATING

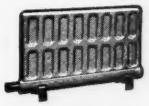
Domestic Infra-red Heaters incorporating new features.

FOR SHORT AND LONG TERM HEATING

Convector Heaters — Skirting Board Styled — two sizes which can be built up in multiples.

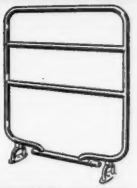
FOR THE HOUSEWIFE

Airing Cupboard Heaters — permanently oil-filled — safe, scorch free and economical in use.



FOR EVERY BATHROOM

Electric Towel Rails — permanently oil-filled — four models available.



AND FOR INDUSTRY

Infra-red Heaters — 2½ kw and 4 kw. Flameproof Electric Radiators — fully Buxton certified.

This advertisement will appear in 70 million copies of monthly magazines between September and Christmas and in scores of newspapers all round the country. Yes indeed, big backing for YOU, plus new literature, new showcards. Write for a supply today.

DIMPLEX LTD
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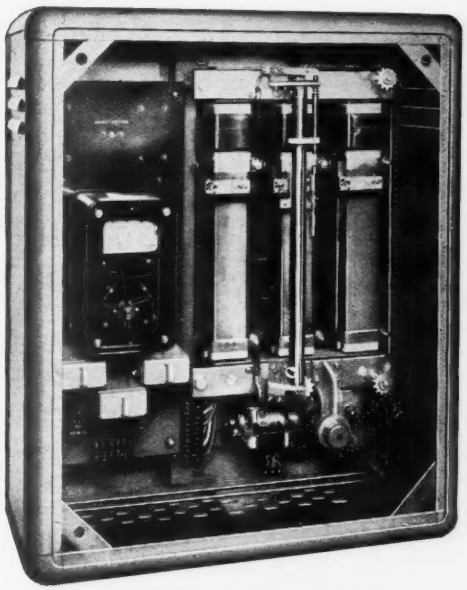
(Continued from previous page)

Berco/BPT Line Voltage Regulators* hold the voltage to within ± 1%

(28 STANDARD SIZES—1-115 KVA)

Berco/B.P.T. Voltage Regulators are at work in transmitting stations . . . at international airports . . . on ocean going liners . . . wherever designers want a strong, reliable unit for accurate voltage control. Berco/B.P.T.'s team of consultant engineers are always at your service. Study the features below, and you'll agree our Line Voltage Regulators prove *Berco/B.P.T. know* how *!*



BERCO/B.P.T. Line voltage regulators. Ask for List 606.

1. Voltage held to within ±1%.
2. Unaffected by variations in supply volts, load, load power factor, frequency.
3. No wave form distortion.
4. 28 standard ratings cover 1 KVA to 115 KVA.
5. Oil immersed and air cooled types.
6. Standard designs ensure good delivery.

BERCO/B.P.T. pioneered this type of Line Voltage Regulator . . .

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THE BRITISH POWER TRANSFORMER CO., LTD.,
in association with
THE BRITISH ELECTRIC RESISTANCE CO., LTD.,
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Telephone: HOWard 2411 : Telegrams: Vitrohm, Enfield BR 1411

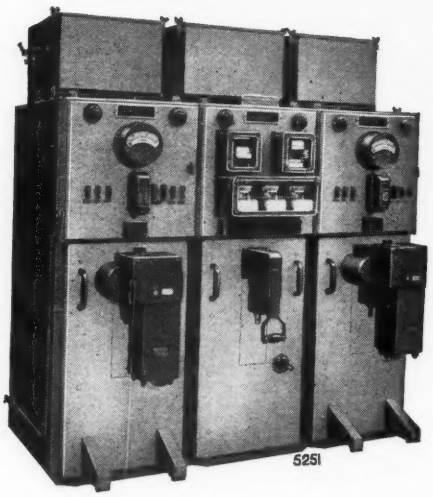
L&C

TYPE AVC

SWITCHGEAR

11 kV 150 MVA

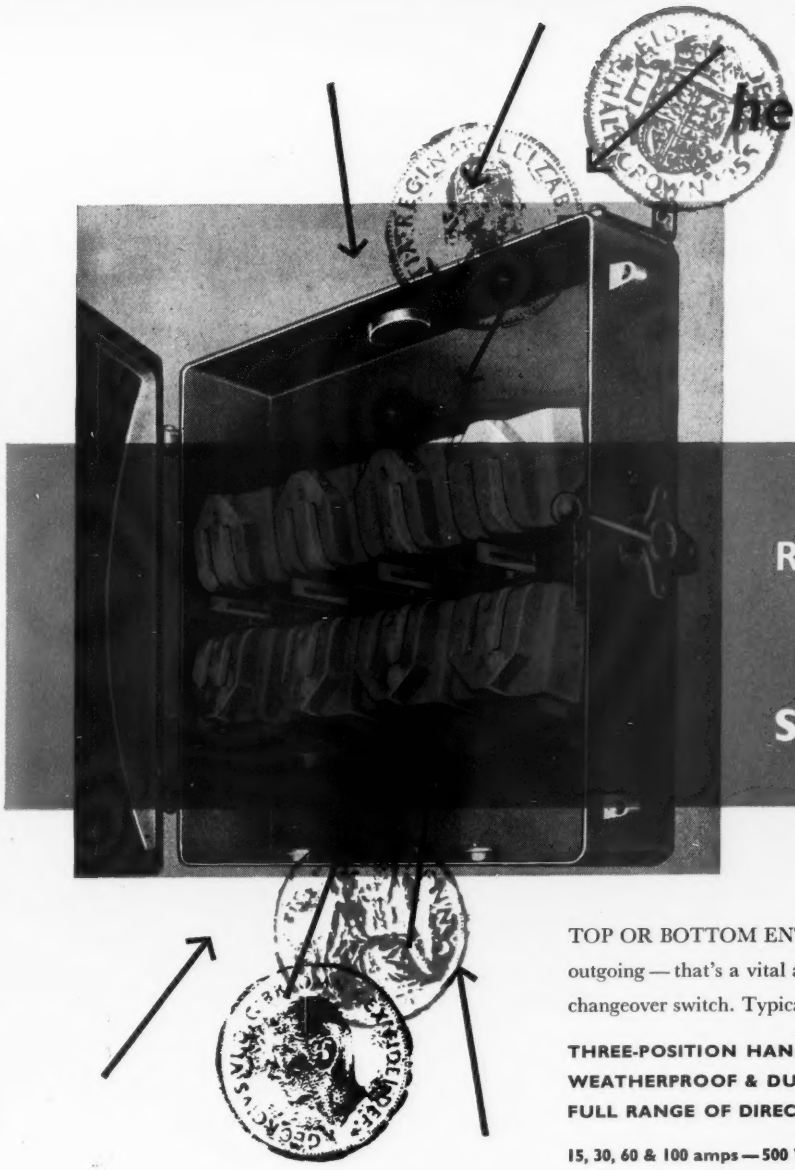
A.S.T.A. CERTIFIED



AIR INSULATED
VERTICAL ISOLATION
HORIZONTAL DRAWOUT

LONG & CRAWFORD LTD.

GORTON ROAD - MANCHESTER 12



heads or tails..

you win!

with

Regent changeover switches

TOP OR BOTTOM ENTRY of all cables, ingoing or outgoing — that's a vital advantage of the Regent changeover switch. Typically sensible — typically Simplex!

THREE-POSITION HANDLE LOCK
WEATHERPROOF & DUST-EXCLUDING TO BS 861
FULL RANGE OF DIRECT MOUNTING FACILITIES

15, 30, 60 & 100 amps — 500 V
D.P., T.P., T. P. & NEUTRAL, FOUR POLE

it's the *installed* cost that counts!

Regent changeover switches by

Simplex

this man works for you..

Simplex have a whole team of practical experts — whose job it is to help you with designing, building and advice on Simplex Switchboard installations. Write or telephone the Simplex Switchboard Service.

Write for List SW 2114 to

Simplex Electric Co Ltd Oldbury Birmingham

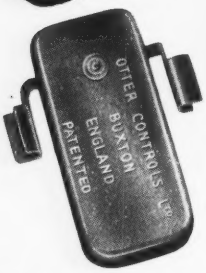
Branches throughout Britain and agents throughout the world

A (71) COMPANY

B

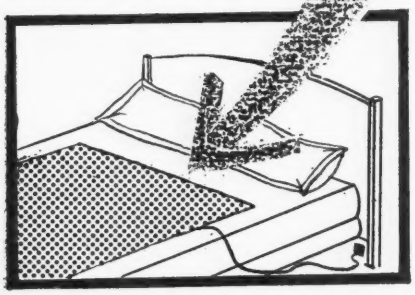
Otter

BLANKETSTAT



The *simplest and safest* heat controller.

- MINIMUM RADIO INTERFERENCE
- HIGHEST CONTACT PRESSURE



and

BLANKET SAFETY CUT-OUT

When fixed in electric blankets or pads complying with B.S. 2612 and B.S. 1789 the Otter Snap Action Blanketstat and Blanket Cut-out will satisfy the relevant requirements.

WRITE FOR LEAFLET No. 8

OTTER CONTROLS LTD

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for modern grease lubrication

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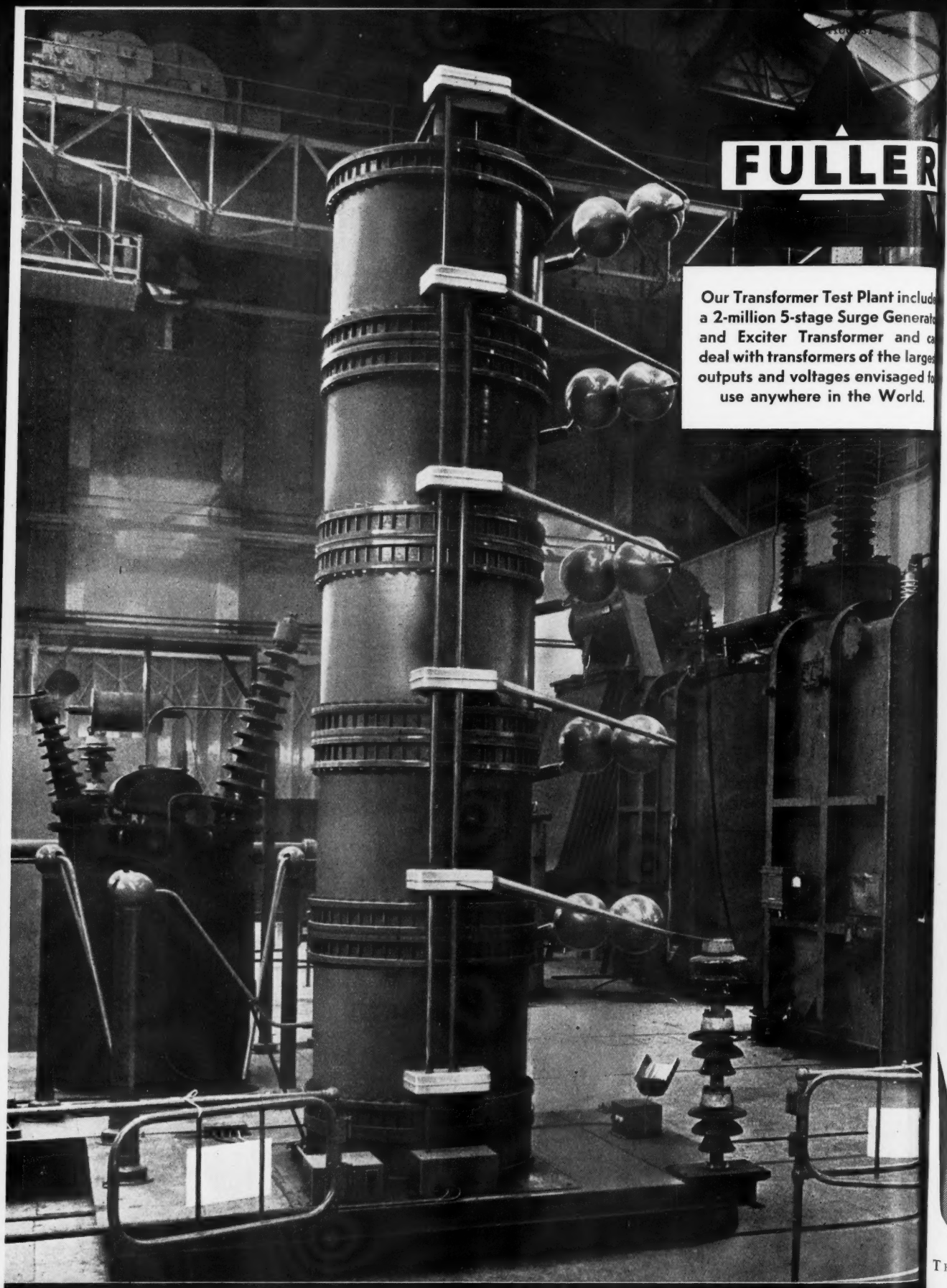
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Our Transformer Test Plant include
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deal with transformers of the larges
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use anywhere in the World.

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ASTA certified

The Association of Short-Circuit Testing Authorities (ASTA) issues Certificates of Rating for fuses giving satisfactory performance when tested in accordance with the appropriate clauses of British Standard 88.

The following ASTA Certificates have been issued to cover the complete range of 'ENGLISH ELECTRIC' Type 'T' Cartridge Fuse Links.

ASTA CERTIFICATE NUMBERS

RATING AMPS	LIST NOS.	B.S.88: 1939	B.S.88: 1947		B.S.88: 1952	
		440 AC 4	440 AC 4	440 AC 5	440 AC 4	440 AC 5
30	TIA30	617	1016	2074	3334	3246
60	TIS60	616	903	2022	3338	3254
100	TC100	615	932	2021	3335	3263
200	TF200	251	933	2033	3278	3237
300	TKF300	252	934	2032	3255	3238
400	TM400	629	935	2031	3249	3240
500	TT500	354	936	2025	3250	3239
800	TLT800	353	2098	2026	3256	3251
1200	TX1200	•	•	•	3257	3258

•1200 amp rating added to range in 1952

'ENGLISH ELECTRIC'
h.r.c. fuse links

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2
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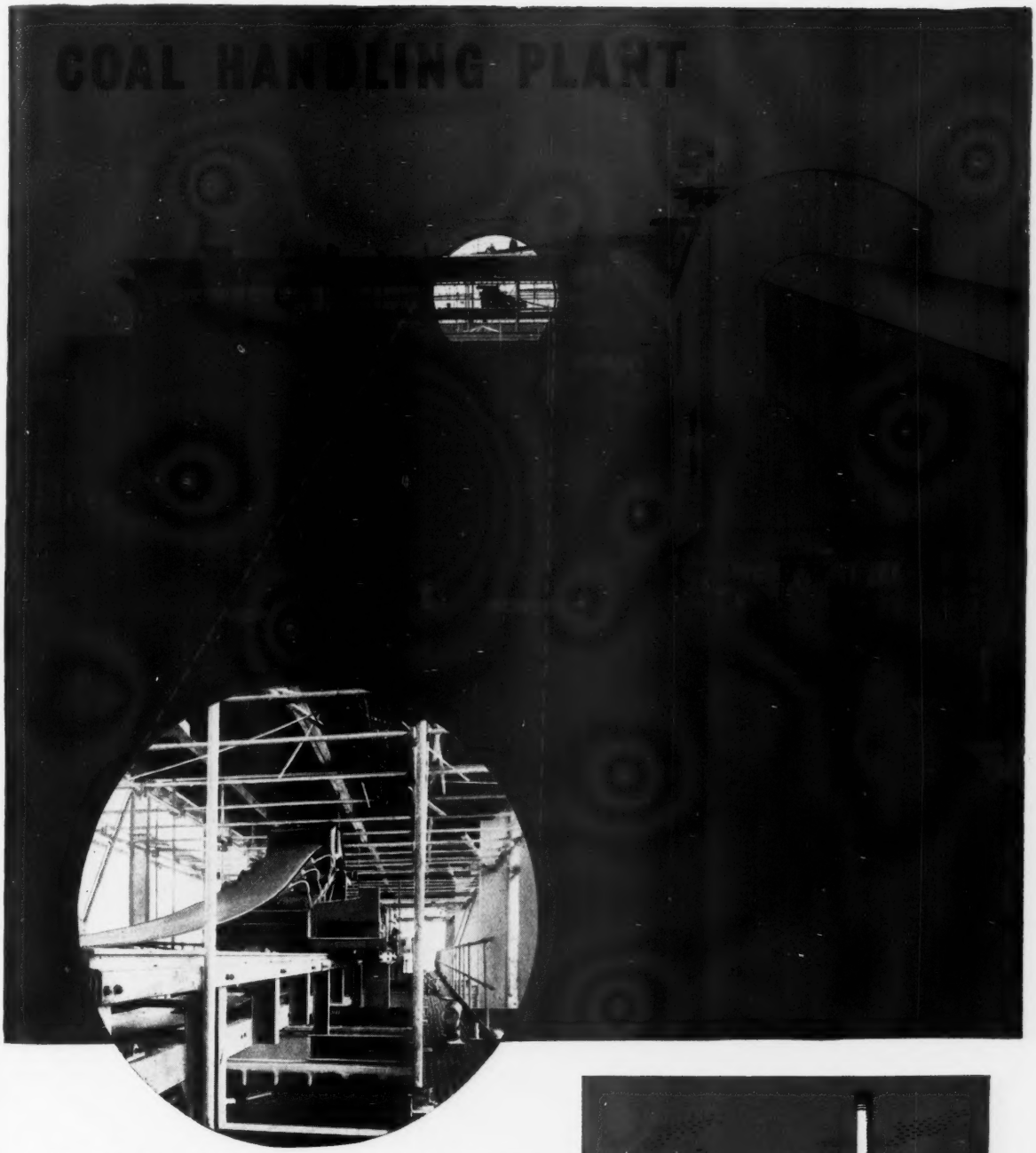
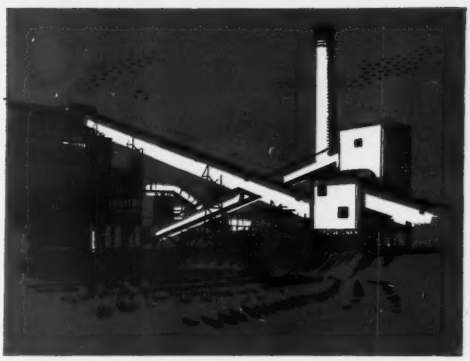


The Coal Conveying plant, seen above, during construction of the boiler house at the new Grimsby factory of Messrs. Courtaulds Ltd., was designed and constructed by the John Thompson Conveyor Company. The plant handles 100 tons an hour receiving from both rail and road transport, and feeding boiler house bunkers via a distributing conveyor and automatic tripper.

The John Thompson Conveyor Company are able to advise on coal conveying machinery for every purpose and have facilities for carrying the job through from the drawing board to the final product erected on the site.



JOHN THOMPSON CONVEYOR COMPANY · JOHN THOMPSON GROUP

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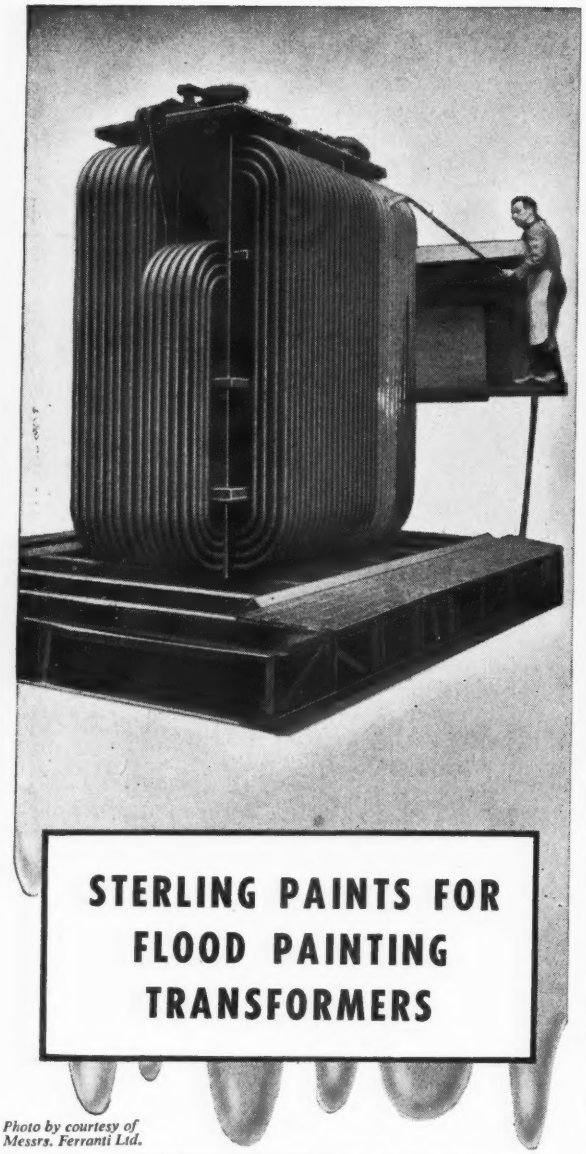

STERLING PAINTS FOR FLOOD PAINTING TRANSFORMERS

Photo by courtesy of Messrs. Ferranti Ltd.

Use STERLING PAINTS for floodpainting transformer tanks, and you can —

- ***Cut labour costs by 50%!***
- ***Cut paint consumption by 25%!***
- ***Get protection where it is needed!***

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SERVICED BY ENGINEERS

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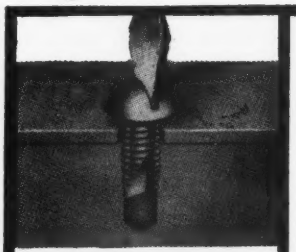
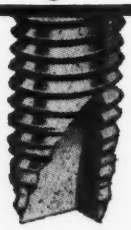
Telephone: EALING 9152

dm. ST.7

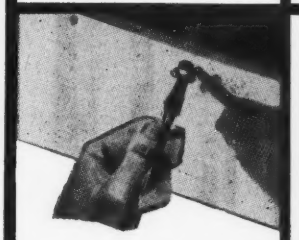
Why use a thread cutting screw?



'Shakeproof' screw's thread-cutting slot ensures true tapping action.



'Shakeproof' thread cutting screws give immediate assembly savings.



Elimination of tapping operation gives savings in labour, tools & time.

Self-cut threads mate accurately — give vibration resistant fit.

A.I.D. APPROVED

FOR METAL TYPE 1 *(All standard threads)*

FOR DIE CASTING TYPE 23 *(All standard threads)*

FOR PLASTICS & SHEET METAL TYPE 25 *(Special coarse pitch thread)*

"SHAKEPROOF"

Reg. Trade Mark Nos. B611535

THREAD CUTTING SCREWS

British Patents Nos. 386895 · 551478

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SB5

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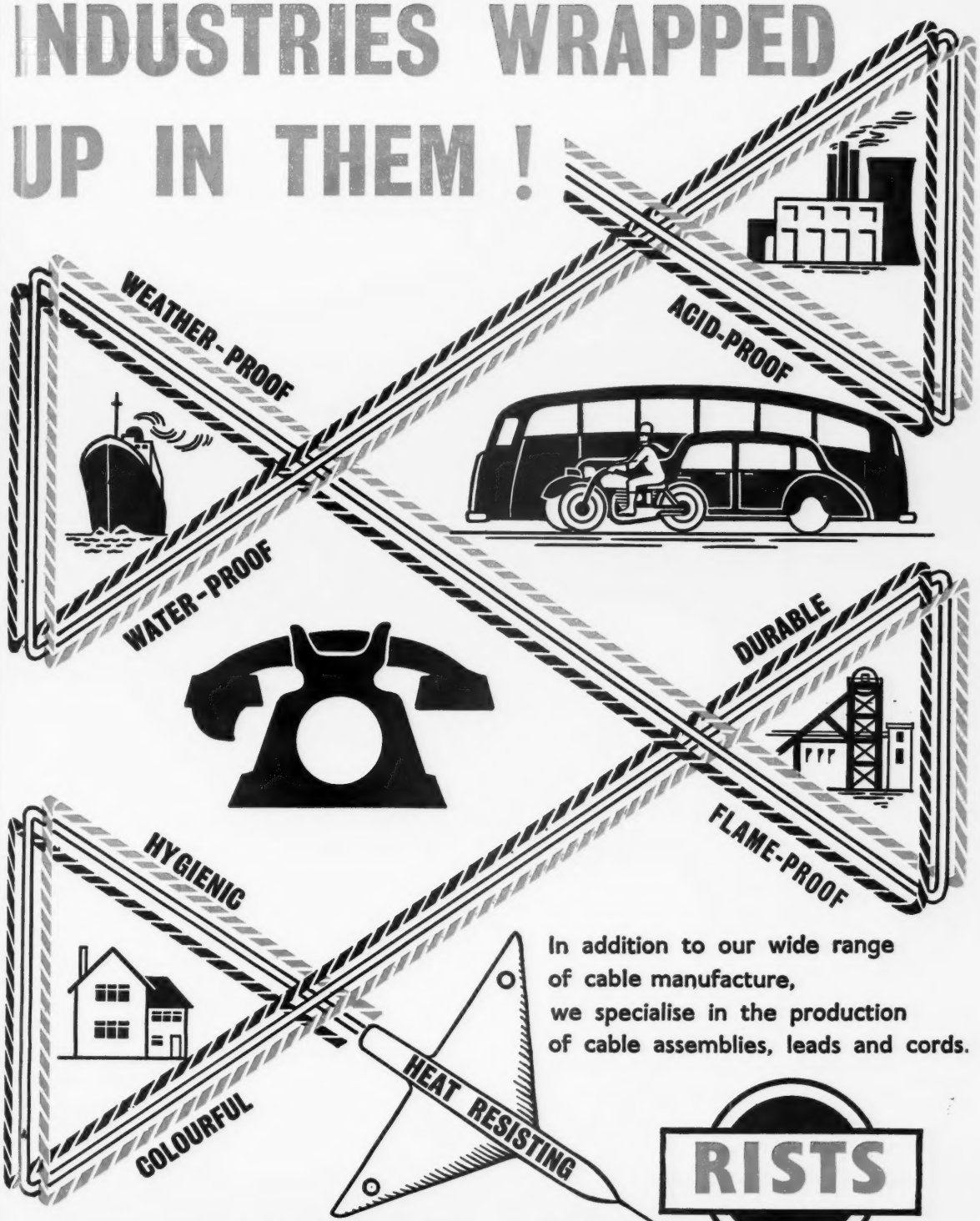

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THE MULTI-PURPOSE CABLE

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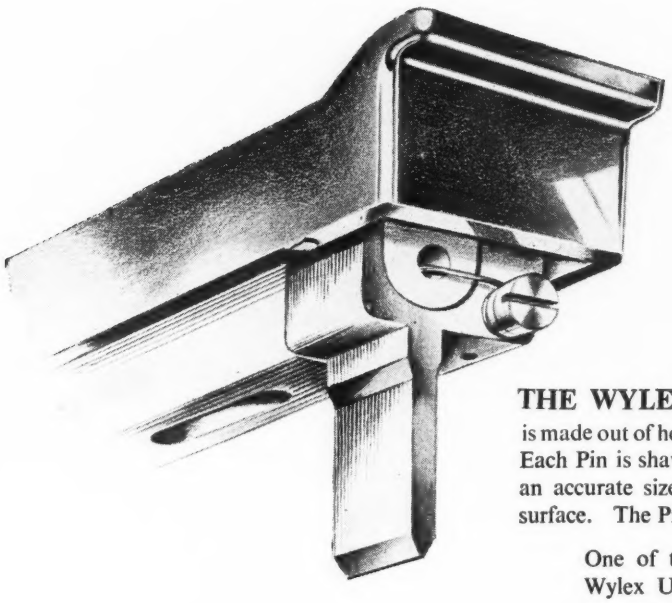

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ANY COMBINATION OF
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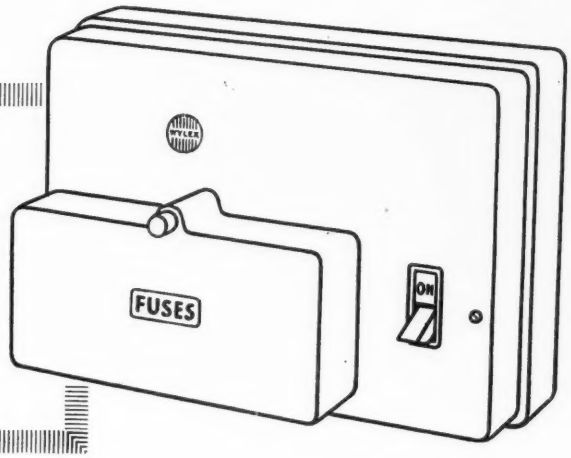
Rewirable or H.R.C. Cartridge



GEORGE H. SCHOLES & CO. LTD., WYLEX WORKS, WYTHENSHAWE, MANCHESTER 22

'WARM-GLOW'

BEST SELLERS

IN ELECTRIC BLANKETS BECAUSE THEY'RE MADE IN

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AT PRICES TO PLEASE ALL POCKETS

'WARM-GLOW' 'VIGILUX'

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SHOCKPROOF AND SAFE FOR OPERATOR AND INSTRUMENT

This instrument will SAFELY carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

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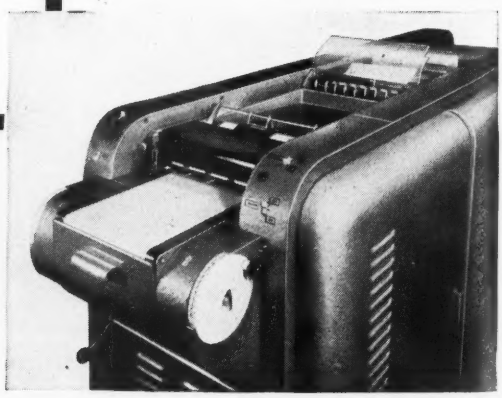
Telephone: HOLborn 3401.



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There is a wide range of BICC Indoor Terminal Boxes for use with paper-insulated cables of up to and including 1,100 volts. They are made from cast iron, in flat, flanged and circular shapes. For installations where maximum economy is essential there are also models moulded in insulating material.

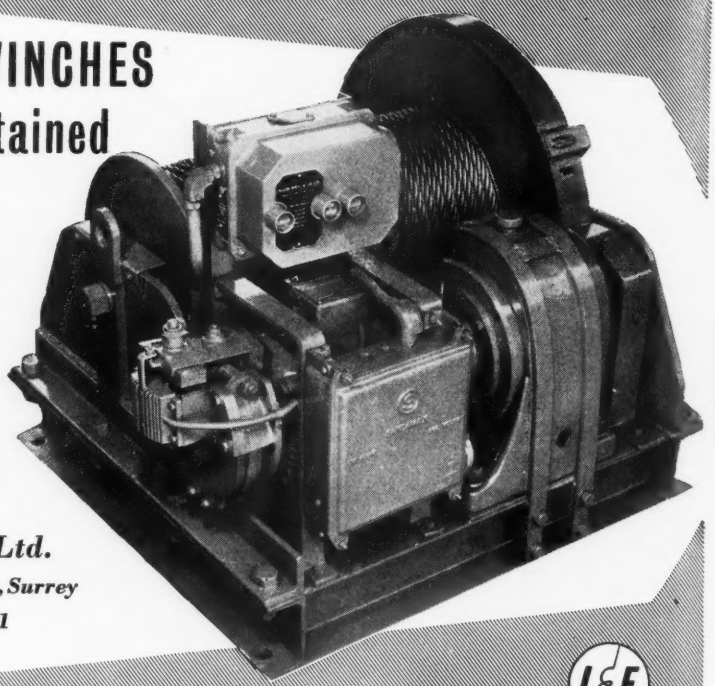
A full range of compounds and tapes is available for use with all types of boxes.

We will be glad to give you further details about Indoor Terminal Boxes, Joint Box Compounds and Insulating and Protective Tapes on request.

BICC INDOOR TERMINAL BOXES

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1

L.E.F. ELECTRIC WINCHES
portable & self-contained



After using one of these L.E.F. electric winches, Metropolitan Vickers Co., Ltd., of Manchester, found it so satisfactory that they placed an order for three more.

Portable, self-contained and capable of handling loads of up to 2½ tons, these winches are made with the skill and precision which characterises all L.E.F. winches.

Send for details of standard equipment or we shall be glad to manufacture to your special requirements.

London Electric Firm Ltd.
Brighton Road, South Croydon, Surrey
Telephone: Uplands 4871

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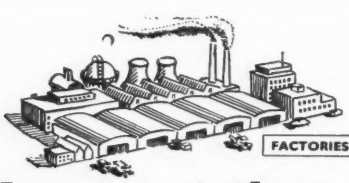
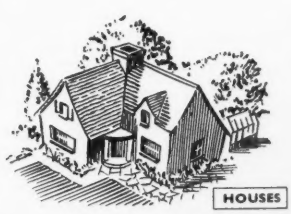

FACTORIES

AEROPLANES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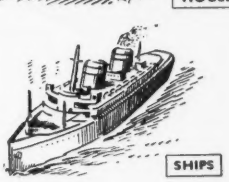
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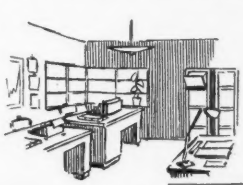
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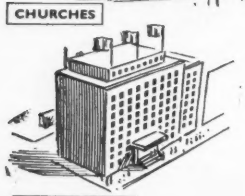
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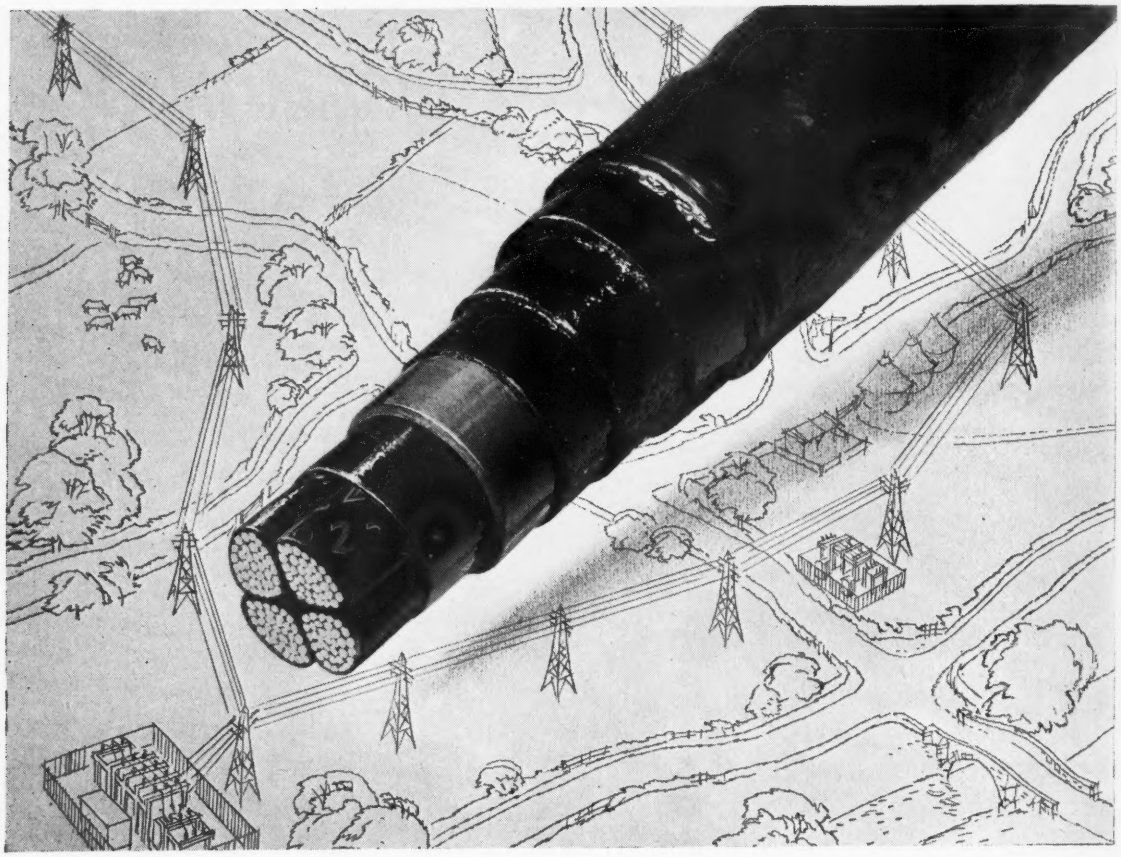

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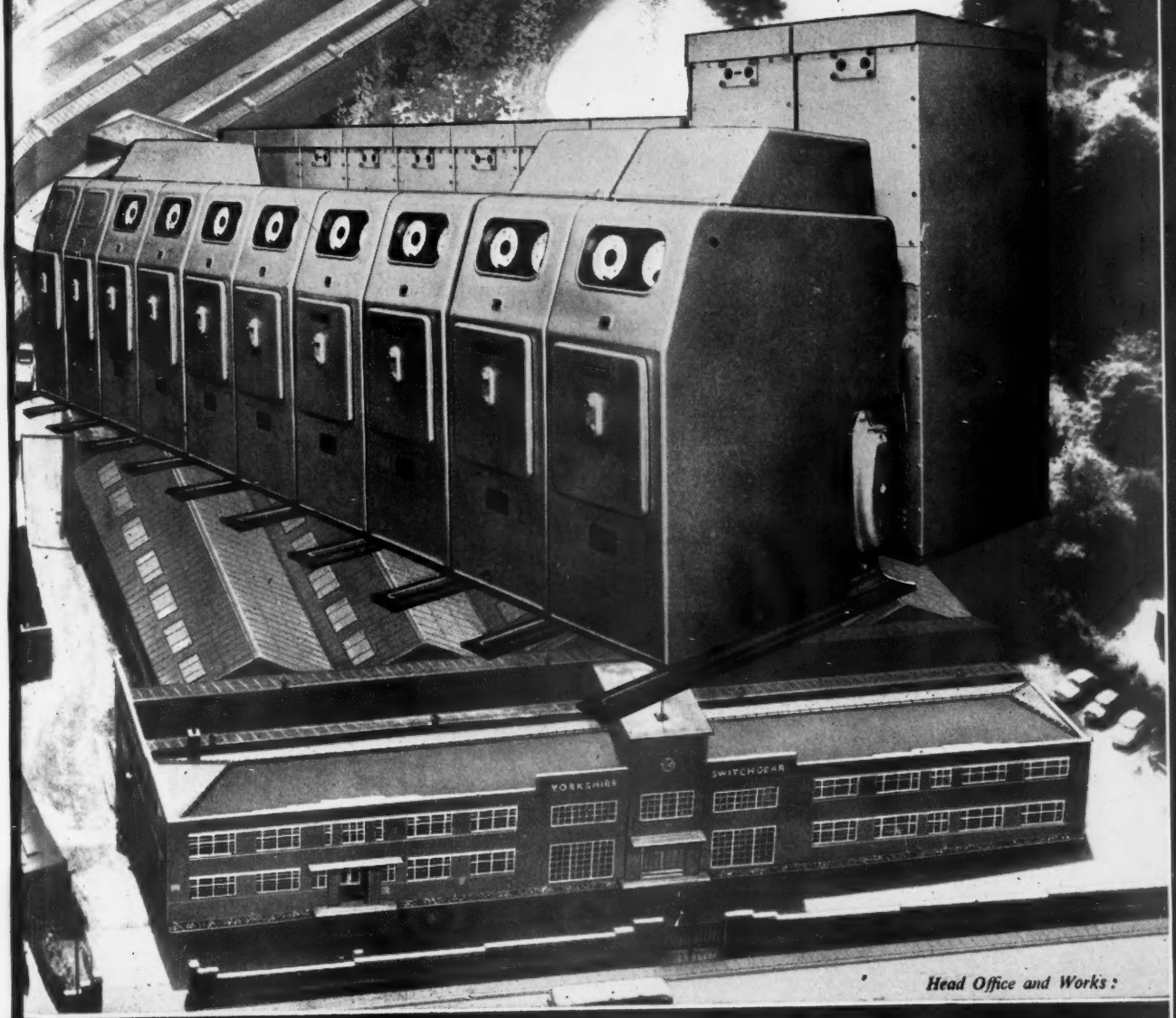

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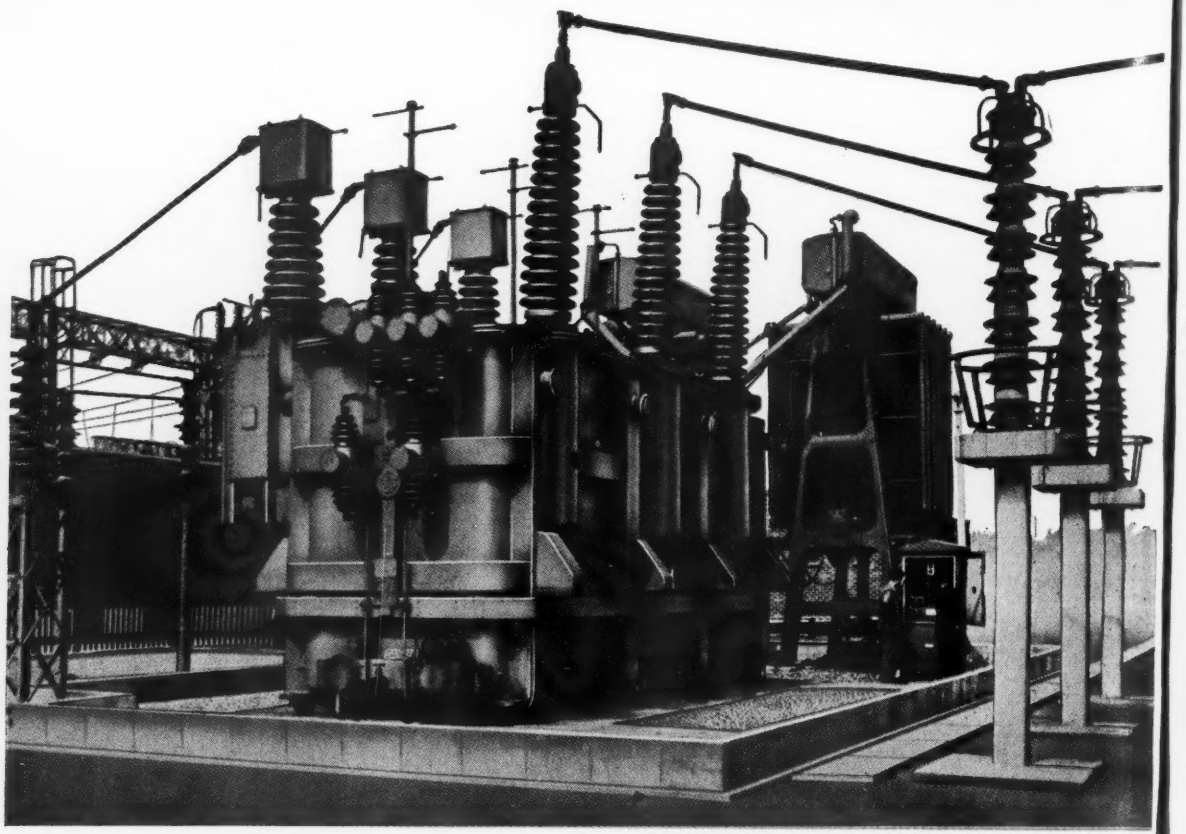

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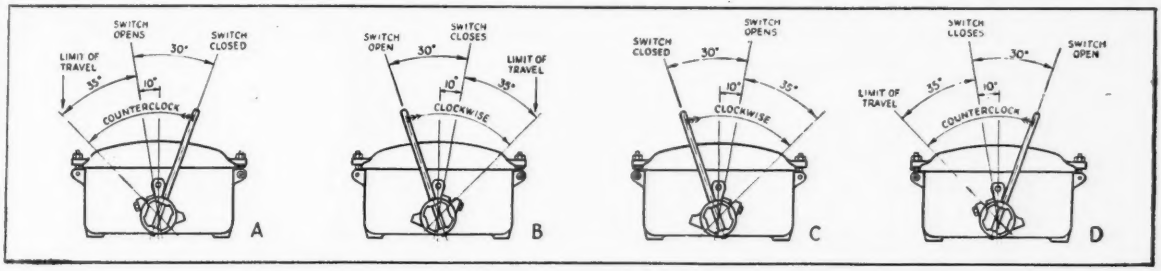

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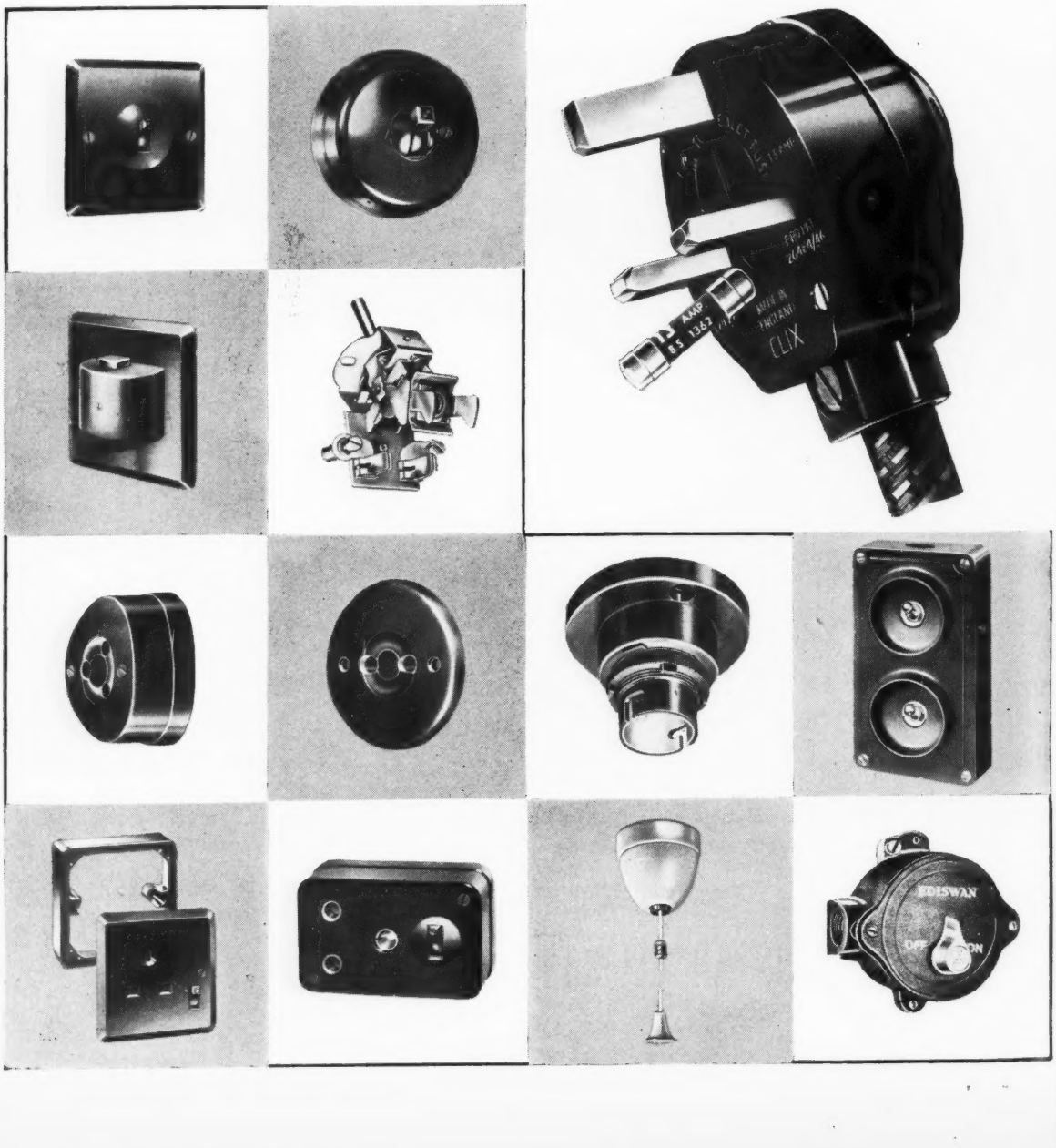

16 AUGUST
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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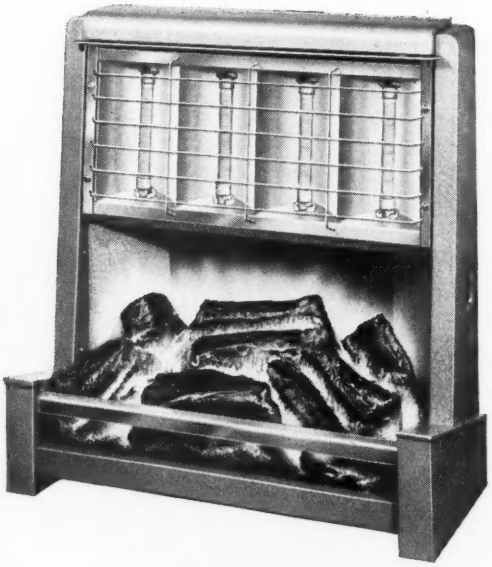

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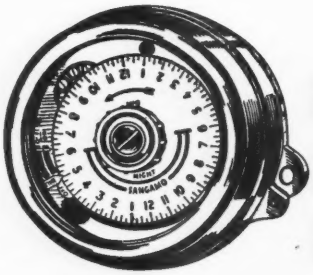

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ELECTRICAL REVIEW

16 August 1957 Vol. 161 No. 7 Established 1872

Public Boards and Private Citizens

HOW to draw the line between efficiency of administration and the rights of the individual citizen is a problem of increasing difficulty. Any Act of Parliament which regulates operations so complex and so technical as those of electricity supply cannot possibly be specific and final on all points. On some points it can only prescribe a procedure, such as a tribunal, an inquiry or a hearing, whose findings the Minister can subsequently implement.

This delegated and consequential legislation has to preserve a proper balance between the public interest which it promotes and the private interest which it disturbs. If, for example, the nationally-best site for a power station or route for a transmission line is opposed by sectional interests there must obviously be some mechanism whereby the general interest can ultimately prevail. It is equally obvious that such mechanism must provide a means of redress, under some procedure which commands respect and in which the least powerful individual can feel that he will get a fair hearing. This is a case in which justice not only must be done but must clearly be seen to be done.

The report of the Committee on Administrative Tribunals and Inquiries under the chairmanship of Sir Oliver Franks has just been published.* The report recommends, *inter alia*, that the inspector who presides over an inquiry or hearing should be under the control of a Minister not directly concerned with the subject-matter of his work, and it suggests that the main body of inspectors in England and Wales should be placed under the control of the Lord Chancellor. The report admits that this might in practice be a change in name only but insists that " here the appearance is what matters." Other recommendations are that the inspector's report should be published and that the Minister's letter of decision should set out in full his findings and inferences of fact and the reasons for the decision.

Whatever may be thought as to the practicability of the proposals the Committee is certainly not the first to experience a certain uneasiness at the spectacle of an inquiry being conducted by a Minister's inspector into a scheme which that Minister has himself initiated, or in which he is a highly interested party. Such feelings, even if irrational, cannot be entirely disregarded, and when an objector finds that the office in which he lodges his protest leads out of the one which has issued the ultimatum, he is bound to feel somewhat frustrated. A similar feeling sometimes arises from the use by Electricity

* Cmd. 218. H.M. Stationery Office, 5s net.

Consultative Councils of facilities provided by the Area Board over whose activities they are watching.

Prior to nationalisation the problem was neatly solved through the existence of the Electricity Commissioners. Standing apart from the actual operators they were able to offer the Minister advice at once expert and disinterested, and to provide, when necessary, inspectors from a source which even the Franks Committee could hardly question. Meanwhile the problem grows with each new Act of Parliament, and it is noteworthy that the latest Electricity Act besides adding duties regarding the preservation of amenities has stiffened the procedure for obtaining overhead line and power station consents.

AMERICAN NUCLEAR DIFFERENCES

Against its will, the United States Atomic Energy Commission has been directed by a Congress committee to construct a " Calder Hall " type reactor at a cost of about $40 million. Up to now the Commission has been devoting its efforts to the design and construction of more advanced types in conjunction with private concerns. Mr. Lewis Strauss, the chairman of the Commission, resents being directed by non-technical people to produce any particular type of reactor and he also objects to any extension of the programme of Government-owned reactors.

A majority of the members of the Congress committee are of the opinion that nuclear export prospects of the United States will be jeopardised by leaving development entirely in the hands of private companies. One member seems to have impugned the good faith of Great Britain by suggesting that the United States could not rely exclusively upon this country for particulars of the operation of gas-cooled graphite-moderated reactors, as was arranged under the recent Anglo-American agreement for the exchange of information.

HULL TELEPHONES

Following fairly closely the recent announcement by the Postmaster General of his intention to raise telephone charges, comes the report for last year of the Hull municipal telephone system which records a deficit of about £20,000 for the second year in succession after a surplus of about £33,000 in 1954-55. It has plainly become necessary for the Corporation to consider means of increasing the revenue, but the manager (Mr. H. V. J. Harris) is reluctant to raise the present call-box charge of 2d although it compares very favourably with the 4d charged by the Post Office for local calls. The service generally is much cheaper than that of the Post Office and the accounts could be balanced by a moderate increase which would still leave a wide margin between the Corporation's charges and those in the country as a whole.

To be fair we must admit that care has to be exercised in comparing the Hull and the G.P.O. services. The city and its environs form a compact, well-populated " island " which is free of the burden of long-distance lines which other urban areas have to help pay for, although, of course, Hull subscribers calling outside points have to bear some share of the cost of these lines. The fact remains that this is an urban system which is normally able to pay its way although its rates are lower than those of the Post Office.

CORROSION

The value of metal lost through corrosion and the consequent cost of maintenance of structures and pipe lines is known to run into several millions of pounds each year in this country alone. Too often, as Mr. T. P. Hoar points out in a letter to *The Times*, is this evil accepted as inevitable, in which connection he draws attention to the educational work now being carried out by the Society of Chemical Industry. The appeal is directed to industrialists as well as to technologists, since the cost of mitigating corrosion may appear high, though in reality it is usually only a small percentage of the value of the damage otherwise possible.

This was shown by Messrs. Hobgen, Spencer and Heselgrave in their I.E.E. paper on cathodic protection last session (*Electrical Review*, 15th March). The subsequent discussion indicated the need for close collaboration between public service authorities and other bodies to prevent protected structures interfering with adjacent metalwork.

UTILISATION ECONOMY

In parallel with the fundamental researches now being carried out as essential to progress in the future come the more numerous, though usually less conspicuous, investigations that promise relatively early useful results. An important activity in this field of applied research is directed towards the more complete use of existing materials and equipment, many examples of which are cited in the D.S.I.R. report reviewed in this issue (page 286).

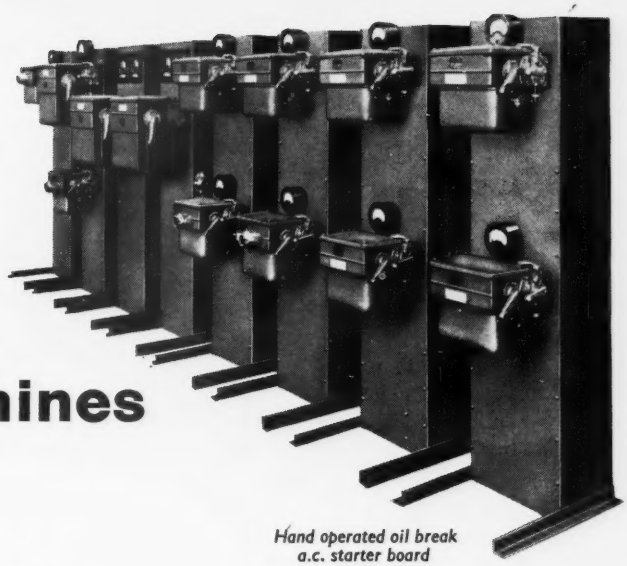
The interest displayed by all countries in this aspect is illustrated in a new publication (No. 84) of the International Electrotechnical Commission, which points out the possibility of making profitable use of the ability of mercury-arc convertors to carry current peaks far above the rated values. This implies the need, when settling the dimensions of a convertor, to take account of the load cycles corresponding to the anticipated maximum load diagram over twenty-four hours.

START OF AN EPOCH

Although electric light is now generally regarded as part of the natural order of things, many people can recall the bad old days before its use was widespread. Swan's invention in 1878 of the earliest practical incandescent lamp resulted in Faraday's discovery, in 1831, of the principle governing electricity generation becoming of service to multitudes throughout the world. The " division of electric light " into units of small candlepower had a secondary effect. It made feasible the public distribution of electricity from central stations as a nucleus for the more extensive uses of electricity several years later. Although few fruits of concentrated research can have brought in their train benefits so great to the greatest number, no reference is made to it in some published estimates of the most important inventions of the past century.

Comparison of Available Types of Industrial Gear

Control of Electrical Machines



Hand operated oil break a.c. starter board

By J. N. M. LEGATE, B.Sc., A.M.I.E.E.*

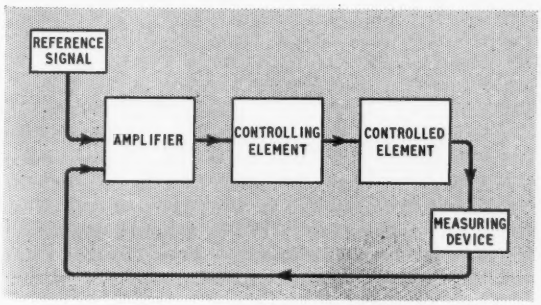
THE word "control" in electrical engineering covers a multitude of devices ranging from push-buttons and master switches or controllers to complex projects broadly referred to nowadays under the rather imprecise word "automation." This article is intended to summarise the general types of apparatus being used for starting and/or producing specified characteristics from rotating machines such as electric motors and generators, and it is hoped will give some impression of the problems dealt with by a control gear engineer to-day. It attempts to show that although there are many ways of tackling a motor control problem, a satisfactory type of gear can be recommended by the engineer provided the operational requirements are made known fully to him, but that if he is not fully informed in the initial stages of a new project, the best result will not necessarily be obtained from his efforts.

The history of control gear is closely related to the development of supply and distribution systems, and the associated trends in motor design. Readers are probably familiar with the a.c./d.c. controversy in the early days of electricity supply, and it is noticeable how the popularity of d.c. drives has been gradually reduced in favour of the a.c. induction motor. Moreover, reduced voltage starting schemes (star delta, auto-transformer, etc.) were often of necessity specified for induction motor drives owing to the limited capacity of distribution networks and feeders, but nowadays, in this country at any rate, there is not often much objection to the use of direct starting for squirrel cage motors on the grounds of supply capacity, although other factors such as mechanical shock on the drive may be adequate reasons for reduced voltage starting of squirrel cage motors. It should not be lost sight of, however, that the transient current peak at the point of switching from the starting to the running condition may be of appreciably greater amplitude than the direct starting peak. The increased capacity of supply systems has at the same time introduced other problems for the control gear manufacturer, notably in regard to the increased prospective faults against which protection must be provided.

There has been a steady trend from manual to contactor type control gear, continuing at an increased rate up to the end of the last war. This trend has been accelerated by the shortage of skilled operators, with a consequent desire on the part of users to have a greater degree of automatic or semi-automatic operation, and has consequently continued even further into the "closed loop" type of control, the improved performance of which often results in increased output and a better product. This comparatively recent technique has now become well established and, in the writer's opinion, will be used more and more in future, although it will probably not oust the more conventional types of gear, except in the more inherently difficult projects such as continuous processes.

It is probably convenient at this point to detail, rather broadly of course, the categories of control gear available to-day. Not everyone who is not intimately concerned with design and manufacture of control gear realises the variety of types in common use. The problem of variety is in fact one of the control gear manufacturers' greatest difficulties, and it has been accentuated by the increased complication associated with automatic contactor and closed loop schemes referred to earlier. Starting and control equipment has nowadays to be capable of suiting the following alternatives:—Supply: a.c. or d.c.; Duty: starting, controlling or regulating (closed loop); Operation: hand or automatic; Type: air break, oil break, or others (e.g. liquid resistance); Enclosure: open, enclosed ventilated, drip-proof, weatherproof, flameproof, etc.); Control schemes: very numerous—e.g. resistance schemes, direct

* Assistant Chief Engineer, Industrial Control Department, Metropolitan-Vickers Electrical Co., Ltd.



Block schematic of basic closed loop system

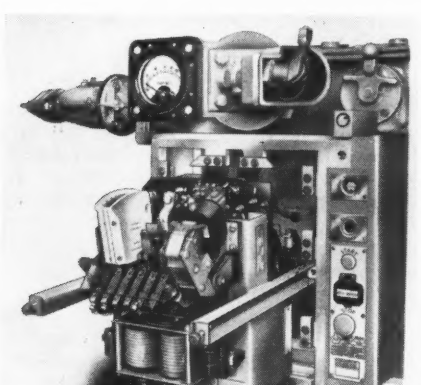
on, auto-transformer, Ward-Leonard schemes, boosters, etc., electronic, magnetic amplifier, grid-controlled rectifier, etc.; Electrical rating and mechanical duty: B.S. 587 and 775 lay down a large number of classifications.

It will be obvious that the number of combinations of the above variables is very large, and the control gear manufacturer must be organised to provide great flexibility in design, based on the use of standardised components. Deviations from standard cause serious problems which unfortunately, although understandably, are not always fully realised by the user whose new equipment consequently may be delayed longer in manufacture and caused to be more expensive than would be the case if completely standardised gear was available to meet his requirements.

Fortunately, not all of the possible combinations of variables mentioned above occur in practice, and it is possible to generalise somewhat to narrow the field. The following considerations may show some of the factors influencing demand.

Constant Speed Drives

Induction motors are most commonly used and the modern tendency is, as mentioned above, towards air-break contactor gear, although hand-operated oil and air



Flameproof gate-end box, interior partly withdrawn

break gear is still very common. The relative merits and drawbacks of the various types may be taken broadly as:—

Oil break. Compact; reasonably fumeproof; contact burning more intense than on air break gear; contact maintenance a rather dirty job; fire risks appreciable in case of damage or fault.

Air break. In theory less compact than oil break, in practice little different at any rate on medium voltages; cleaner for maintenance; often more accessible than oil break.

Hand operated. Usually highly standardised, and cheaper than contactor gear except in the case of direct-on starters where cost may not be very different; some degree of operating skill necessary; interlocking circuitry somewhat restricted.

Contactor equipment. Adaptable to a wide range of application, permitting elaborate interlocking and great adaptability to special circumstances (except in the simplest and smallest ratings, where a high degree of standardisation and inflexibility may be found); there is, however, an appreciable increase in cost where such special considerations are catered for, as "custom built" gear is necessarily more expensive than standard; unskilled operators may be employed.

Variable Speed Drives

The greatest variety of types of control gear and of the techniques used applies to variable speed drives. Both a.c. and d.c. drives may be employed; the supply in the latter case may be made available from m.g. sets (as in Ward-Leonard schemes) or from static rectifier equipment. Control schemes may be "open loop" or "closed loop," and it is in this latter category that the greatest difficulty occurs in deciding which combination of equipment gives the best practical arrangement. The two types of scheme are in fact sometimes difficult to differentiate, as open loop systems often operate as coarse closed loop systems using a human feed-back link. Before dealing with closed loop systems it is convenient now to explain the difference between the two systems.

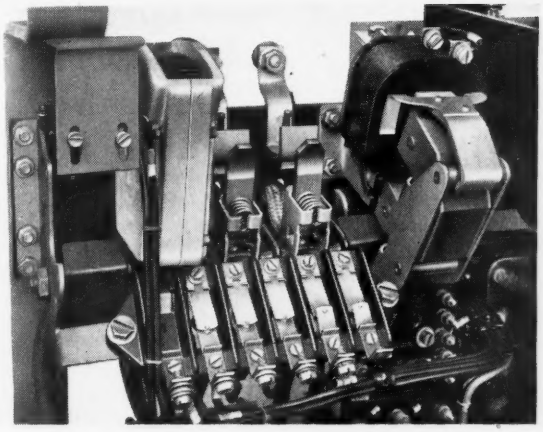
Open loop schemes do not attempt to "control" the output. The operator sets up a condition on his "controller," which he knows from experience will give the output performance he requires. For example, a crane driver, using a drum controller with rotor resistance on a slip-ring motor drive, could set his controller to an intermediate notch on which he would expect to get, say, half speed hoisting with half full load on the crane hook. If, however, he has underestimated the load, or if the supply voltage is down, the speed he obtains may be less than he expected. He then proceeds to convert the system to "closed loop" control by receiving (through his eye or ear) the impression that his estimate was wrong and taking correcting action (through his brain and hand) to alter the controller to a position which he knows will produce more power and accelerate the load to a speed nearer to what is required.

The above train of events is exactly what is done automatically in a closed loop control scheme, the basic principle of which is that a control or input signal is compared with an output or reset signal and the difference or error is used to alter the energy output to reduce the error. A crane control system operating on closed loop could, for example, be made to give half speed for a certain controller position, within very close limits, irrespective of load on hook or supply voltage—an obvious advantage, for instance, on a steelworks or foundry ladle crane. The accuracy of control obtainable is, to a great extent, defined by the accuracy with which the difference (error) between control and reset signals can be measured, and in practice some form of amplifier is always required. The fundamental block circuit is as shown on page 267. The connection between the measuring device and the amplifier provides negative feed-back and closes the loop, and accounts for the term "closed loop control." The practical components of such a system could consist of:—

(*a*) *Controller.*—A device producing a voltage proportional to required output, e.g. in a speed control system it could be a potentiometer, the voltage between the slider and one end of the resistance being proportional to speed required.

(*b*) *Error detector.*—Usually a resistance network in a scheme of the type being considered.

(*c*) *Amplifier.*—A number of different types of equipment may be employed. Electronic circuits immediately come to mind, but rotary and magnetic amplifiers are also commonly used and electronics may include gas-filled hot cathode valves such as thyratrons, grid-



Typical present-day a.c. contactor showing arc splitter

controlled mercury pool arc rectifiers or hard (vacuum) valves in various combinations, e.g. hard valve amplifier for first stage, magnetic amplifier for second stage, and Ward-Leonard set or metadyne set for third stage. Alternatively, a magnetic pre-amplifier controlling a mercury-arc rectifier might also be used. It should be noted that a Ward-Leonard generator is a power amplifier in its own right. A further alternative is sometimes usable in the form of a "fluttering relay" and, in fact, vibrating contact type voltage regulators are on occasion adapted for motor speed control systems.

The advent of semi-conductor devices, such as transistors, will probably influence future preferences in techniques, but in the present relatively early stages of development the writer does not find it possible to generalise on future trends so far as industrial applications are concerned.

(*d*) *Reset device.*—Possibly a tachometer-generator giving, for example, voltage output proportional to motor speed. Considerable controversy has taken place in the past on the relative merits of a.c. and d.c. tacho-generators. In the writer's opinion, the d.c. type has much to recommend it for industrial applications. Other forms of reset device may be used depending on the quantity being controlled, the final quantity usually being a voltage proportional to the controlled parameter.

Components

Contacts. There has been a good deal of discussion recently regarding the merits of different types of contacts and protective devices. The picture is by no means clear, but the following is the author's assessment of the general opinion in the British control gear industry regarding some of the main components and materials, the comments given covering both "conventional" and closed loop control equipment.

Copper to copper is generally accepted as the most satisfactory combination. Sintered contacts such as tungsten/copper or tungsten/silver may on occasion be found to give improved contact life. There appears to be little correlation, however, regarding life and contact duty, and until some further comprehensive investigations have been carried out and results co-ordinated it will be difficult to decide the relative merits of available materials for all applications.

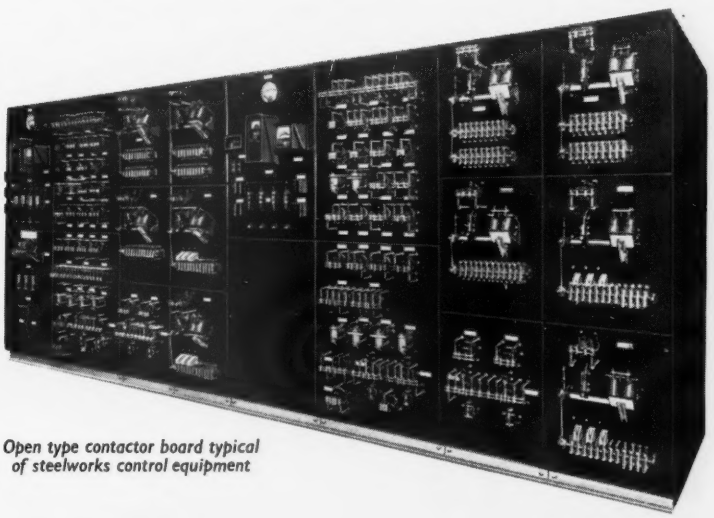
Silver has considerable advantages for small currents and for continuous current carrying. Frequent duty, however, may cause hammering of the relatively soft silver. Silver is more prone to welding than copper, but trouble may be avoided by suitable design.

Carbon appears to show some advantages on light current contacts, but its use is not yet very common, and it suffers from greater contact losses and consequent heating than with the equivalent copper section and contact pressure.

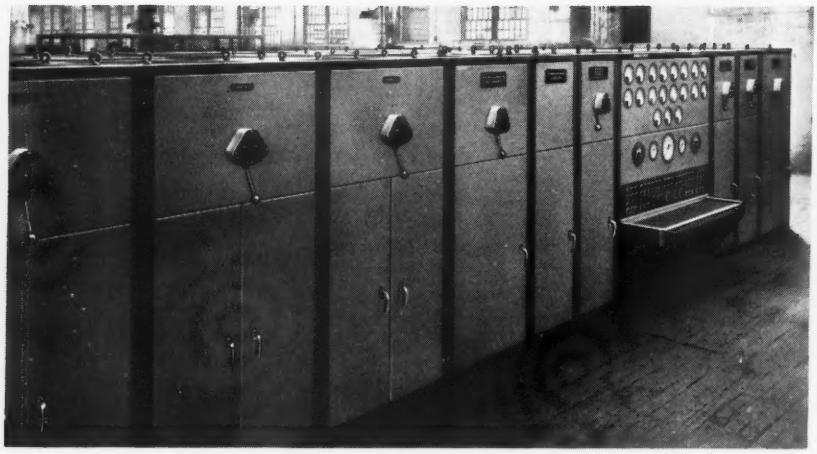
Arc control devices. The magnetic blow-out reigned supreme until a few years ago and is still very common. Arc splitter techniques are now coming into favour, and undoubtedly compare very favourably in performance with blow-outs on a.c. Other means of arc control are also in use, and in practice commercial designs of arc control devices are satisfactory. It must be admitted, however, that the method adopted has usually been arrived at empirically, and experience is necessary in the use of the various arrangements available before the preferred type for any specific application can be positively recommended.

Overcurrent relays. There is considerable disagreement among users on the relative merits of magnetic and thermal overcurrent relays. Although both types give an approximation to an "inverse" characteristic, the behaviour of the two devices is quite different. For example, a thermal relay integrates I^2R heating over a period and consequently would ultimately trip after a series of "inching" operations on a direct-on starter. A magnetic relay would, however, reset to a fixed point on its characteristic after each start, and so apparently is a less satisfactory protective device in such circumstances. It must be realised, however, that unless the characteristics of machine and relay are closely matched, the thermal relay may tend to over-protect, and consequently cause loss of production on some drives. Here again, experience and "know how" on the part of the control engineer usually result in the users obtaining a good practical compromise.

The ideal would, no doubt, be a temperature measuring device in the motor, but this technique has not been applied to any extent. There are numerous technical difficulties which are outside the scope of the present article, but the writer believes that this system would,



Open type contactor board typical of steelworks control equipment



Multi-cubicle starter board for pumping station

perhaps, be capable of at least as good protection as any of the present common arrangements. The rating of motors on c.m.r. without overload capacity may accentuate the desirability of a new approach to the problem. From the control gear manufacturers' point of view, the elimination of a wide variety of coils or thermal heaters would assist standardisation. After all, it is usually temperature that has to be limited by the protective device.

The necessity for single-phasing protection has been debated inconclusively for many years. Single-phasing protective relays are available and are satisfactory within their limits. Complete protection is difficult to obtain cheaply. For example, a delta-connected motor may have an appreciable overload in a winding under single-phasing conditions, although line current is not excessive.

Isolating switches. Some confusion exists at present as to whether an isolator should or should not be an emergency stopping device. If the isolator is regarded solely as a means for rendering the starter and motor dead for maintenance it need not be capable of breaking load. If, on the contrary, it is required to shut an equipment down on load, the switch must either be capable of breaking the motor starting peak, or some mechanical interlock must be introduced to ensure that operation of the isolator opens the starter by a positive knock-off. (An electrical interlock does not protect against a frozen or stuck starter or contactor, and although these effects are not very common, the worst foreseeable case must be catered for.)

Closed Loop Control Schemes

The position becomes further complicated when closed loop schemes are considered, owing to the number of different types of amplifier in common use to-day. They consist broadly of:—Electronic hard (vacuum) valve systems; electronic soft (gas-filled) valve systems (gas or mercury type); electronic grid-controlled mercury pool rectifier (mercury thyratron, mercury-arc rectifier, ignitron, excitron, etc.); rotary amplifiers (cross field excited—metadyne, amplidyne, Magnicon, etc.); rotary amplifiers (conventional excitation) — Ward-Leonard schemes, etc.; magnetic amplifiers, conventional or flux resetting types; vibrating relay systems; and electro-hydraulic systems.

Most amplifiers in closed loop systems for industrial schemes are more than single-stage. Here are typical cases:—(1) Single-stage conventional magnetic amplifier followed by thyratron output on to armature of d.c. shunt motor. (2) Two-stage valve amplifier followed by conventional or flux resetter magnetic amplifier controlling field of Ward-Leonard generator. (3) Single-stage valve amplifier controlling flux resetter magnetic amplifier operating on to field of Ward-Leonard generator. (4) Single-stage magnetic amplifier operating control winding of rotary amplifier which itself controls the field of a large d.c. shunt motor. (5) Valve amplifier controlling phase shifting and peaker circuit of mercury-arc rectifier feeding armature of d.c. motor. (6) Valve amplifier controlling pilot hydraulic "amplifier," which itself controls a high power hydraulic amplifier (oil servo gear) governing the position of liquid controller electrodes.

Why is it that such a variety of systems is in use? One reason is the great rate of development in these new techniques, and the final and best universal equipment has not yet been found. Perhaps it never will. The advantages of the various types (and their disadvantages) are difficult to tabulate concisely as a good deal depends on particular circumstances, but the following factors must be taken into consideration:—

Hard valves are very sensitive and permit great flexibility in choice of amplifier circuit. They are easily obtainable and are cheap to replace. Life is, however, finite and somewhat unpredictable, although "special quality" valves for industrial purposes are now available. The high impedance circuits usually associated with hard valve amplifiers may cause some difficulty in "trouble shooting" without a reasonable amount of experience in the techniques.

Soft valves, e.g. thyratrons, are a very convenient source of medium power (say, up to 30 h.p. drives). The characteristic arc glow is useful in diagnosing incipient or actual faults. Life is again somewhat unpredictable, but this is not a serious problem with present manufacturing standards. Nevertheless, replacement costs are appreciable, particularly in the larger sizes. A new mercury thyratron may require upwards of half an hour conditioning time, and in any case always needs an initial warming-up time (of several minutes in the large sizes) before being put on load.

Conventional magnetic amplifier. Robust, usually less complicated and much lower impedance circuitry than hard valve system, but in general less sensitive and slower in response than the all-electronic type of amplifier. Bulkier and more expensive than corresponding valve amplifier, but the improved reliability and ease of servicing has great advantages for industrial drives. Power outputs are generally less than the corresponding soft valve equipment can provide economically owing to sluggishness and cost of large equipments.

A recent development, the flux resetter magnetic amplifier, has all the advantages of the conventional type but with a response equivalent to a grid-controlled rectifier (thyratron, ignitron, mercury-arc rectifier), and it appears to be capable of quite high power output; 100 kW is practicable, probably considerably more. Special magnetic core materials are essential and the associated rectifiers

are preferably of the junction germanium or equivalent highly efficient type. Problems have existed in the availability of these materials, but are being rapidly resolved, and the flux resetter appears to offer one of the best methods for future industrial closed loop control systems.

There are other more subtle factors influencing the design of closed loop schemes, mainly associated with the difficulty or otherwise of providing stable (non-hunting) control. In some cases these may be the deciding factor in reaching a decision, but this can often only be decided after preliminary detailed designs have been analysed.

Control Schemes

It is at this stage that we may now endeavour to compare possible approaches to various problems and for the sake of convenience a few random applications have been chosen to illustrate the considerations which must be taken into account before arriving at a decision on the right type of gear to put forward.

Only the more obvious conditions have been cited, viz: (*a*) Site conditions: Space, atmospheric conditions, feeder capacity, special preferences. (*b*) Application conditions: Accuracy of control, starting duty, process requirements. (*c*) Economics: First cost, type of labour available.

I. *Constant Speed—Machine Tool Drive*

(*a*) Space limited, atmospheric pollution from adjacent chemical plant, limited feeder capacity, oil immersed gear preferred.

(*b*) High control accuracy required, frequent starting but light starting torque, product is average commercial grade.

(*c*) First cost must be kept low, skilled labour available for machining.

The conclusion reached is that although the user prefers oil immersed gear, frequent starting duty would be better dealt with by air break contactor equipment; star-delta starting would be satisfactory. There is sometimes a case for a closed loop constant cutting speed scheme on machine tools, but not in this instance. Special attention would have to be given to meeting atmospheric conditions and limited space.

II. *Constant Speed Drive—Fixed Frequency Supply for Test Department*

(*a*) Site conditions: Space not critical, clean conditions, supply conditions bad—voltage and frequency subject to severe fluctuation.

(*b*) Application conditions: Accurate fixed frequency and pure waveform required for precision instrument testing. It would be advantageous if some frequency variation could be provided for non-standard tests.

(*c*) Economics: First cost not a primary consideration. Value of the product being tested is defined by its performance; highly accurate test conditions essential.

This is an easy one. A precision closed loop control of a motor alternator set gives the answer. The cost of such a scheme nowadays compares not unfavourably with a conventional variable speed drive which in effect is what is required, but with exceptionally high accuracy of control at one speed.

III. *Variable Speed Drive—Ventilating Fan*

(*a*) Site conditions: Space not critical, supply conditions average.

(*b*) Application: Accuracy of control not very important for periods of several hours, but speed changes may be required at intervals due to changed conditions of air demand.

(*c*) Economics: First cost and running losses are important. Manual supervision is available but a semi-automatic system may eventually be desirable.

There seems to be little case for closed loop control. The centrifugal fan characteristics are acceptable for a slip-ring motor drive as losses are not excessive at reduced speed and speed range is not very wide. Possible methods are liquid regulator, drum or cam contactor controller or contactor gear. The possible addition of auto control suggests that a liquid regulator with provision for the addition of motor operation might suit, and contactor gear is an alternative possibility. The ultimate scheme will probably depend on cost and may be narrowly in favour of one or the other, depending on rating.

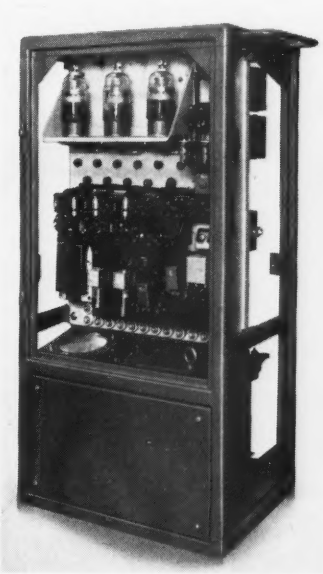
IV. *Variable Speed Drive—Paper-Making Machine*

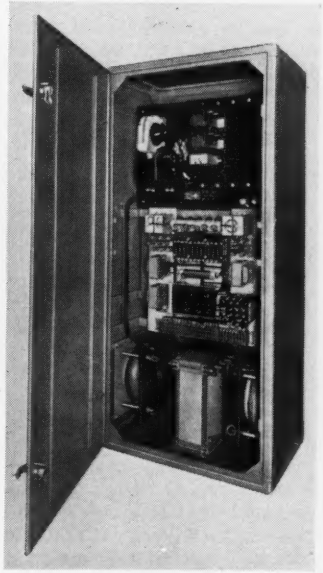
(*a*) Site conditions: Hot and humid with possibility of water being hosed over machines, reasonable amount of space, supply not particularly constant as partly obtained from mill generator.

(*b*) Application: High accuracy of control and extremely accurate speed ratios between successive sections required with provision for easy and very precise adjustment of running conditions. High inertia occurs on some drives. Reliability of great importance.

(*c*) Economics: This old-established industry has developed a number of different types of drive and the competitive position requires careful consideration.

Technical demands suggest the use of high performance closed loop (probably electronic or magnetic amplifier type) gear. Operational and site conditions require careful consideration of mechanical design and layout of equipment.





Left: Closed loop control scheme cubicle for machine tool application. This equipment uses gas-filled thyratrons and magnetic pre-amplifier

Right: "Conventional" magnetic amplifier cubicle

The above are relatively clear-cut examples of typical control gear problems associated with industrial drives, and the probable conclusions arrived at by the engineer, assuming he has been given the relevant facts.

The conclusions reached in regard to the use of open or closed loop schemes are fairly straightforward in the examples chosen, but in many other practical cases considerable experience and good judgment are necessary to ensure that the best solution is arrived at. In many cases, indeed, information which might have influenced a decision may not have been originally available, due to ignorance both on the part of the buyer regarding differences in attack on control gear problems, and on the part of the design engineer who lacks complete familiarity with the application or with the special circumstances appertaining thereto. I remember one case where ambient temperature was extremely high because of the proximity of a drying chamber which was out of commission when the site was originally investigated.

Perhaps this article may have given a rather confusing picture of the control gear position to-day. It is admittedly becoming more complicated every year, and is steadily assuming major importance in industrial efficiency. If you are considering new plant, here are some principles to work on:—

Where it is known that an existing type of drive and control scheme suits your plant, use the present-day equivalent when replacement is necessary and allow the manufacturer maximum freedom to employ his own standards. Where improvement is wanted, give the control gear engineer the maximum information about your application, discuss it with him, and allow him time to do full justice to the comparison of possible available methods. If he suggests some completely novel idea do not reject it on grounds of unfamiliarity. Some of the latest schemes have proved at least as reliable and trouble-free as the older conventional ones. In spite of suggestions to the contrary, British control gear engineering is not lagging behind overseas competitors in either technical advances or in satisfactory designs. One of our national vices is to proceed cautiously and sometimes we do not publicise our latest ideas sufficiently—or soon enough.

In the writer's opinion, closed loop control will become more and more essential in the interests of production efficiency, and even to-day the possibilities of the flux resetting magnetic amplifier are numerous. The more familiar conventional types of control gear are, however, unlikely to be ousted for a very long time, although the newer techniques now available will naturally take over a proportion of applications previously carried out less efficiently by the older methods.

Improvements in the natural course of technical evolution are nevertheless taking place steadily in conventional components (contactors, relays, etc.) and the motor control gear manufacturing industry will cope with anything likely to be demanded from it, although like many other groups in industry, manufacturing capacity is heavily stretched at present.

Slower Load Growth in Ireland

DIFFICULT economic conditions resulted in a lower rate of electricity expansion in Ireland last year, states the Electricity Supply Board in its report for the twelve months ended 31st March last. This was particularly evident in the industrial sphere; under the motive power tariff, the second largest category after domestic, sales amounted to 432·5 million kWh, only 0·6 per cent more than in 1955-56. Industrial demand in the last quarter was, in fact, no greater than in the corresponding period of the previous year.

Altogether 1,655 million kWh was generated, an increase of 4·7 per cent (this compares with 7·6 per cent in the previous year). Financially, the Board benefited from the favourable hydrological conditions. In a year with average rainfall hydro-electric output would be about 590 million kWh, but last year 689 million kWh was produced, the increase representing a saving of some £285,000. Peat stations produced 318 million kWh and other steam stations 636 million kWh. Fuel costs, after payment of a new duty on oil amounting to £135,400, were less by £177,134. Generation from oil continued to be cheaper than from coal or sod peat, but preliminary results at the Ferbane power station indicate that milled peat will be cheaper than oil.

The installed capacity of the Board's generating stations at 31st March last was 567·5 MW (188 MW in hydro-electric stations). New stations under construction will add 261 MW. The report states that the closest touch is being maintained with all developments affecting the use of nuclear energy for power purposes.

Activity in the provision of new supplies continued at a high rate, with 38,364 additional consumers connected of whom 34,627 were in rural areas. At the end of March the total number of consumers served by the Board was 547,910.

The report points out that heavy capital expenditure to overtake arrears accumulated during the war years has now passed. Rural electrification has already been extended to about two-thirds of the possible consumers and the end of the work is approaching. In consequence, financial requirements in the next few years will not be so large as in the past. Furthermore, the reduced rate of growth of demand has made necessary a review of capital investment and it has been found possible to defer certain expenditure. The generating plant capacity installed and in process of installation is now adequate to meet any foreseeable load in the immediate future.

Gross revenue last year amounted to £11,601,754 (against £10,515,368). Part of the increase was brought about by higher charges to consumers. Two of the factors which made it necessary to revise tariffs were the increased capital charges and the withdrawal of the rural development subsidy. The loss on the year from rural electrification was £491,645. After providing for capital charges there was a net surplus on the Board's operations last year of £1,891 (against £184,523), to which is added £48,293 profit on merchandise and installation trading and the balance of £121,341 brought forward from the previous year.

The value of plant commissioned was £11·4 million and £10 million expenditure was incurred on new capital works still under construction. Capital expenditure on the rural electrification scheme amounted to £3,665,142. The year's target of 80 areas was achieved; the 543 areas now completed cover 14,834 sq. miles and the proportion of dwellings connected is approximately 77 per cent.

Yorkshire Mill Modernisation

CHANGE-OVER FROM D.C. TO A.C. DRIVES

FOR a conversion scheme from d.c. to a.c. drives at the Cheapside Mill of J. T. & J. Taylor, Ltd., of Batley, Yorks, generating plant, switchgear, cables and a large number of motors and their associated control gear have been supplied by the General Electric Co., Ltd. In designing the power supply system it was necessary to consider factors other than the purely electrical loading. Many of the processes involved in the preparation, weaving and finishing of cloth use a considerable quantity of steam and therefore it was decided to retain the existing Fraser & Chalmers pass-out turbine, but to replace the d.c. generator and rope pulley by a 1,250 kW, three-phase alternator. The total steam demand for process supplies and for heating when the mill is in full operation is in the region of 25,000 lb/hr. This steam is bled from the turbine at 30 lb/sq in. A power supply from the Yorkshire Electricity Board was also installed for regular night and overtime use when the load is too low to justify running the alternator, and the process-steam demand is also low.

Air-Break Switchgear

The main switchboard, installed in the power house, is of the G.E.C. standard cubicle type with air-break gear which is rapidly replacing the older industrial oil-immersed switchgear for medium-voltage installations. In this particular case the switchboard comprises control gear for alternator excitation; two air circuit-breakers, rated at 2,000 A and 1,200 A, respectively, for the incoming supplies from the alternator and from the public supply; four further air circuit-breakers, each rated at 800 A, for main feeder control; and eight 400 A fused switches for distribution circuits adjacent to the power house. The circuit-breakers are arranged for manual operation, although solenoid-operated equipment of this type can be supplied when required. The distribution switchgear in various sections of the mill is of the ironclad type and was built up by the mill staff from the standard range of components developed by the G.E.C. This range comprises a wide variety of ironclad air circuit-breakers, fused switches and switch-fuses, together with cable boxes, busbar chambers and supporting pedestals, all designed so that the greatest possible number of combinations of different units can be assembled to meet individual requirements.

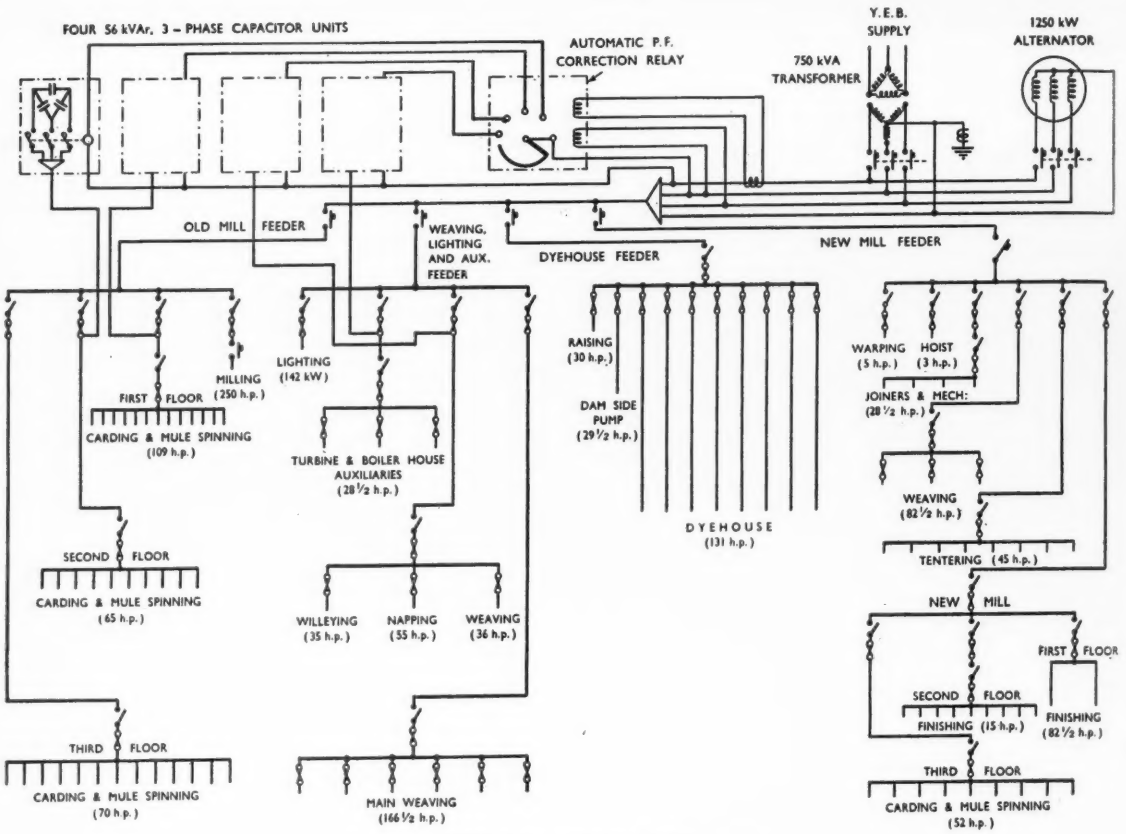
The main distribution board for the new mill section is typical of the equipment employed throughout the installation. It embodies a 400 A air circuit-breaker which controls the incoming supply from the main switchboard, while the outgoing feeder units comprise two 200 A fused switches and four 60 A switch-fuses. All these units are connected through two standard pressed steel busbar chambers coupled together, and the whole is mounted on sheet steel pedestals fitted with back support brackets. The outgoing feeders from this switchboard supply the whole of the new mill section of the installation, further ironclad switchboards and fuse-boards being provided, where necessary, for the various sub-distribution circuits in the individual departments.

The power cables for the modernisation scheme were manufactured by Pirelli-General Cable Works, Ltd. It was decided to avoid the use of large cables by employing, where necessary, smaller-diameter runs in parallel. This arrangement permitted a much neater installation to be obtained using smaller bends, and in many cases reduced the overall first cost. A further advantage was that, in case of a cable fault, a portion of the load could still be carried on the unaffected cables. All the main cables are paper-insulated, single-wire-armoured and served and, in the majority of cases, are three-core. As most of the cables are installed in fairly dry surroundings, cable sealing boxes were not considered necessary, the cable tails being sealed against moisture by means of high-voltage tape. For the dyehouse, where the wiring is subject to attack from chemical fumes and steam, p.v.c. cables were used in galvanised conduit, the conduit being painted outside with synthetic anti-rust paint. The connections between motors and starters were considered to be the sections most liable to deterioration, and the installation was designed so that these runs are easily renewable. One of the chief difficulties in designing a distribution system is the assumption of the load factor to be applied to the total horse-power of motors connected, in order to obtain the continuous rating of the cables.

Individual Drives

The first problem was whether to use individual or group drives. It was found that, by adopting individual drives in all except the milling department, the largest motor required, with this one exception, was 35 h.p., a factor which reduces to a minimum the potential cost of replacement in case of individual machine failures. Furthermore, the introduction of the a.c. supply system enabled full use to be made of the squirrel cage motor, which offers the advantages of robustness and reliability together with the ability to use comparatively simple and inexpensive control equipment. Direct-to-line starters are provided for all motors up to and including 15 h.p., while larger machines are equipped for star-delta starting. The high inertia of the carding engine presents certain difficulties in the matter of starting. In this installation the problem was solved by providing the starters with saturable-cone overcurrent relays. These devices, the design of which has been patented by the G.E.C., will carry the heavy starting

The title picture shows 7½ h.p. 950 r.p.m. totally enclosed fan-cooled G.E.C. motors driving spinning mules



Simplified diagram of the electrical distribution system

currents of the motors, but afford full overload protection during normal running.

The equipment supplied by the G.E.C. for power factor correction consists of four three-phase capacitors, each rated at 56 kVAr, which are mounted in the basement beneath the power house. Each of the capacitors is fitted with its own extractor unit which is normally under the control of an automatic power-factor correction relay, mounted on one end of the main switchboard. This relay includes an element, of the induction watt-hour meter type, which continuously measures the reactive component of the power drawn from the supply and, on this basis, controls the operation of a small reversible motor driving a stepper switch. Movement of this switch makes or breaks, according to the direction of motion, the operating circuits for the four contactor units, and the setting of the relay is such that, at any instant, the total capacitance in circuit is sufficient to maintain the overall power factor at a satisfactory level, whatever the power demand may be. Results in service have shown that the power factor is kept to a figure of approximately 0·965 lagging. It is usually found that the installation of power-factor correction equipment, by its saving in power costs, pays for the capital cost of the capacitors in approximately two years.

Advantages of New Installation

The results of the change-over may be summarised as follows:—(1) A large reduction in the load has been achieved by the elimination of friction losses from shafting, belt drives, etc., the higher efficiency of a.c. drives compared with d.c. and the ability to shut down completely any machine which is not actually in production at any one time. (2) Working conditions have improved due to reduction in noise, better lighting and greater safety. (3) Maintenance work has been reduced. (4) In the case of carding engines and spinning mules, the smoother drives from the a.c. motors are giving an improved product. (5) The ability to operate the factory from the public supply at periods when the load is too low to justify running the turbine has shown considerable savings in power costs, while, at heavy load periods, the extremely economical power generation, using the pass-out turbine, is still realised.

Institute of Physics

THE thirty-seventh annual report (1956) of the Board of the Institute of Physics was presented at the annual general meeting of the Institute held recently. The present Board includes Mr. O. W. Humphreys, president, Dr. C. Sykes and Sir John Cockcroft, immediate past-presidents, and Mr. G. R. Noakes, Dr. W. H. Taylor, Dr. B. P. Dudding and Professor E. A. Owen, vice-presidents.

During the year 752 applications for election or transfer to the various grades of membership were received for submission to the Membership and Examinations Committee. The growth of the Institute membership was indicated by a table covering the past ten years. At the end of the year the total membership was 5,531, as compared with 3,268 in 1947. The graduate examination in June was taken by 45 candidates.

The Institute was among the bodies invited by the Ministry of Education to submit views for the consideration of a Committee set up by the Ministry to give advice on the supply and training of technical teachers. A reply sent on behalf of the Board stressed the view that any increase in the supply of technical teachers should avoid decreasing the number of teachers in universities and schools and the number of scientists engaged in other important work.

NOTTINGHAM UNIVERSITY

LIGHTING IN THE NEW PORTLAND BUILDING

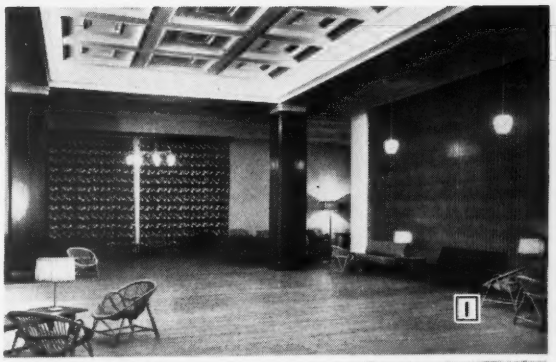
Exterior of the new Portland Building, Nottingham University

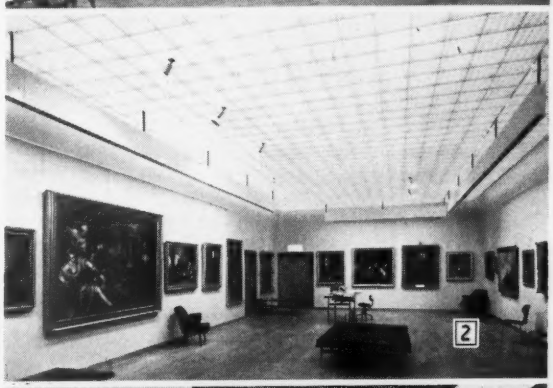
IT is five years since preparatory work commenced on Nottingham University's new Portland Building (officially opened earlier this year) and the lighting scheme, which was developed as the building was being planned and constructed, has occupied the attention of the Lighting Department of the General Electric Co., Ltd., for the past four years. It is a scheme in which contemporary lighting and décor combine and was designed by close collaboration between the architects, Cecil Howitt & Partners, of Nottingham, Sir Hugh Casson, who was responsible for the interior decoration, and the lighting engineers of the G.E.C., which supplied the majority of the lighting fittings.

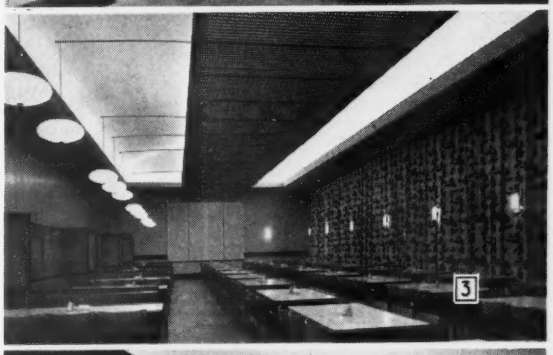
The new building stands on a commanding site in the grounds of the university and among the facilities it provides are common rooms for the academic staff and the students; a ballroom; a library, bookshop and art gallery; a lecture hall and smaller lecture rooms; and a chapel. Full catering facilities are provided in a restaurant, cafeteria, coffee room and buttery.

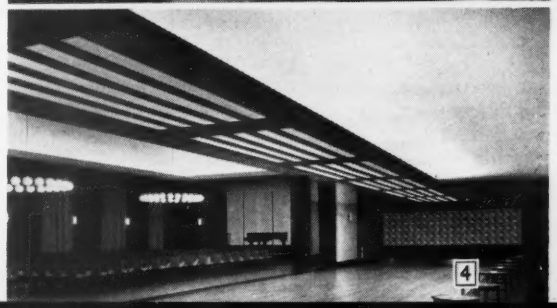
Four ebony black square columns, reeded on two sides, support the deeply coffered ceiling of the concourse lounge. An impression of depth is given to the ceiling by three continuous runs of cold-cathode tubing housed in a shallow cornice. The side walls, in blue and gold, help to show up in brilliant contrast the red and green pleated silk shades of the table lamps placed at points around the room. Additional illumination is supplied by four Chrysaline pendants suspended close to the walls. To add interest to the large expanse of the back wall it has been provided with full-length curtains of black, red and white pattern to simulate the effect of large windows. These curtains are illuminated by a seven-light pendant fitting incorporating lanterns equipped with white glassware decorated with clear lines. Supplementary lighting in the vicinity is from floor standards with shades to match the table lamps.

The ballroom, which is also used for lectures, concerts and public meetings, has a barrel ceiling lit indirectly by









Four views of the contemporary lighting installation. **(1)** *The students' common room illustrating how lighting merges with the décor.* **(2)** *The main gallery of the Department of Fine Art showing the illuminated louvred ceiling.* **(3)** *Cornice lighting is supplemented by pendants in the restaurant.* **(4)** *A suspended plaster "tray" is a feature of the ballroom annexe lighting*

three runs of cold-cathode tubing housed behind a cornice. Additional light is supplied by three pendants, each having a spread of about 12ft and comprising twenty-five 9in Chrysaline spheres. Full-length curtains, in panels of red and yellow, cover one wall and strike a pleasant balance with the blue curtains which are hung on the opposite side of the room to form a movable partition between the ballroom and annexe. This annexe has a flat ceiling at a lower level than the ballroom ceiling, illuminated by a suspended white plaster " tray." Essentially the " tray " consists of troughs extending along the length of the room, and connected with transverse troughs. All the troughs house continuous lines of 5ft 80 W " new warm white " tubes and the light, being reflected from the ceiling and through the " tray " between apertures in the troughs, provides a diffused effect with a high level of general illumination.

Restaurant Lighting

A basketwork panel, suspended beneath the ceiling and stretching the length of the room, is an unusual decorative feature in the restaurant. In addition to its artistic merits, it accomplishes the architects' main object of creating an intimate, friendly atmosphere by lowering the apparent ceiling height. General lighting is by three continuous runs of cold-cathode tubing housed in a surrounding cornice. To supplement the light absorbed by the panel, Chrysaline pendants are suspended from one side. The wall opposite is hung with curtains of green and pink floral pattern on a white background, and Chrysaline wall brackets project through the curtains to provide additional light.

An " egg crate " louvre ceiling creates an attractive decorative effect and provides a high standard of illumination in the main gallery of the Department of Fine Art. The ceiling, of 2in sq louvres, is suspended 14ft above floor level beneath a high north light ceiling, and illuminated by pearl tungsten lamps. Specially designed 5ft fluorescent picture light fittings illuminate the pictures on the wall.

On the lower floor of the building is the chapel where the lighting is by imitation candles, the " flames " of which are miniature 7 V bulbs operating from transformers at the end of each pew.

A high standard of illumination is maintained in the kitchen where vapour-proof fluorescent fittings are installed.

In all, it is estimated that over 3,500ft of cold-cathode tubing has been installed in the building and the total load is in the region of 300 A per phase, the supply being provided by a 415 V, three-phase, four-wire system. The main switchgear and distribution boards were manufactured by Bill Switchgear, Ltd., and the Pritchett & Gold and E.P.S. Co., Ltd., were responsible for the emergency lighting system. Electric clocks (Gent & Co., Ltd.) are installed in most parts of the building and in the few places where it was thought necessary to provide socket outlets " Wylex " dual plug type 13 A sockets have been installed. The main electrical contractors were Lee, Beesley & Co., Ltd., of Coventry.

Second Geneva Atomic Energy Conference

THE British Government have accepted an invitation from the Secretary-General of the United Nations to participate in a second International Conference on the Peaceful Uses of Atomic Energy, to be held in Geneva next year from 1st to 13th September inclusive. The last conference, in 1955, occurred at a time when a great deal of work previously held classified by the United Kingdom, America and Canada was released for publication, and the same will be true of the next one since further important fields of work have recently been declassified.

A provisional topical agenda has been agreed by the seven-nation Advisory Committee, of which Sir John Cockcroft is the United Kingdom member, providing for 12 plenary sessions embodying papers of a general survey type, and four parallel series of technical sessions (68 three-hour sessions in all).

The technical sessions will cover the following subjects: Series 1: Chemistry and the chemical processing of irradiated fuel; reactor technology; radiation damage in reactor materials; handling of highly irradiated materials; treatment of radioactive wastes. Series 2: Nuclear physics, including the physics of fission and fusion reactors; reactor theory; fuel cycles and the economics of nuclear power; research, test and prototype power reactors; reactor experiments. Series 3: Production and uses of isotopes and ionising radiations in research, medicine, agriculture and industry; dosimetry; biological effects of radiation; radiological protection; reactor safety and location; meteorological and oceanographical aspects of the large-scale use of atomic energy. Series 4: Raw material supplies; winning and refining of uranium and thorium; methods of separation of isotopes; metallurgy and fabrication of fuel elements; processing of other nuclear materials.

The Conference will be conducted under the same rules of procedure as in 1955. Officials of the Conference, namely, the president, vice-presidents, secretary-general, deputy secretary-general, chairmen and vice-chairmen of the technical sessions, will be announced later.

Arrangements for United Kingdom participation are being organised through an Executive Committee (chairman, Sir John Cockcroft; secretary, Mr. B. W. Mott) and a Papers Committee (chairman, Dr. B. F. J. Schonland; secretary, Dr. T. A. Hall) on which are representatives of the United Kingdom Atomic Energy Authority, the Central Electricity Authority, industry, universities and other bodies. Titles and 500-word abstracts of papers must be in the hands of the Secretary-General of the United Nations by 1st March, 1958, and final texts by 1st June, 1958.

At present the Papers Committee is engaged on the compilation of a provisional list of titles, with the object of ascertaining the approximate total number likely to be submitted by the United Kingdom and the distribution between the various sessions. It is hoped that this information will be available by the beginning of next month. Organisations represented on the Papers Committee will be approached by their representatives for contributions, but others are invited to communicate directly with the papers secretary at the Atomic Energy Research Establishment, Harwell, Berks, if they have titles to submit or if they seek further information. Inquiries concerning other matters should be addressed to the secretary of the Executive Committee at the same address.

VIEWS on the NEWS

By REFLECTOR

WE have become so accustomed to hearing that British manufacturers pay insufficient attention to the requirements of overseas customers, in contradistinction to most of their competitors, that it is perhaps a little comforting to see in *The Times* that American exporting techniques compare unfavourably in the eyes of South African business men with British (and Continental) methods. This information is contained in the report of an American trade mission to South Africa. The view of the South Africans is that whereas Britain and many European countries manufacture especially for export, and take great trouble to adapt their designs for the countries to which the goods are sent, and see that spare parts are available, the Americans manufacture primarily for their home market and " export markets must adapt themselves to American taste and American standards." The rise in prices is also the subject of complaint. While more or less agreeing with these criticisms the American mission says that the Americans are more ready to establish branch factories in importing countries where local needs and tastes are naturally given preference. So, as they say, there is no room for complacency.

* * *

Forms are very frequently the subject of jest and it is the truth that many forms are of a risible character. Yet in most cases they are the best means of collecting and disseminating useful information. I believe that I have already mentioned an endeavour by the Southern Division of the Central Electricity Authority to ensure that the forms which it uses are necessary and that no more are used than are really required. A " working party " has made a review of the forms in use by the Division and although it has decided that some forms can be dispensed with it has found that the use of forms results in a substantial saving of time and money.

* * *

One of my readers (Mr. I. J. Kightley of the E.M.F. (Electrical), Ltd., Northampton) has sent me a cutting from the since-defunct *Morning Leader*, dated some time in 1907, describing some electro-horticultural experiments by a Mr. B. H. Thwaite, following up work carried out by Sir William Siemens twenty-five years earlier. Thwaite's method was to apply to plants in a greenhouse the rays of a slowly-moving arc lamp which were passed through a coloured-water filter " to separate the ultra-red or heat rays of the spectrum from the violet or chemical rays which are the most beneficial to plant life." Reference was also made in the report to the application of an electric current to the roots of plants to accelerate the circulation of the sap; this was said to result in a much larger crop of such vegetables as potatoes. There were further references to the application of electrostatic discharges for plant stimulation; by this means, it was said, both the roots and the air of the glasshouse were electrified. My correspondent suggests that this might have been what we now recognise as " low-voltage soil heating," but heating doesn't seem to have been the intention, although it may have been incidental.

* * *

Protests have appeared in the *Leicester Mail* (backed by a leading article) about a donation of £5,250 by the East Midlands Electricity Board and the Central Electricity Authority, jointly, to the Leicester University Appeal Fund. The newspaper is concerned at such action by a nationalised industry which it contrasts with a private enterprise concern, saying:—

> " The directors of a local company who make a donation are answerable to their shareholders and certainly have a strong case for local pride, prestige, and the immediate gain to industries of having a university in the city is quite tangible."

It does not seem to be impressed by an argument put forward by an official of the Board that the Board looked to universities for recruitment and was thus directly concerned. I think it right that nationalised industries should show as much interest in local affairs as private companies. In this particular case the Board and the Authority are acting within the terms of the 1947 Act which permits them to carry on any activities which appear to them to be " requisite, advantageous or convenient."

Since I wrote this I have learned that the South Western Board and Division are making a donation of 5,000 guineas to the University of Exeter Development Appeal Fund. Reporting this, the *Western Morning News* says that " the two authorities are very anxious to increase the output of scientists."

* * *

The following passage comes from an article in the *Electrical Review* of 16th August, 1907 (half a century ago) and not, as might justifiably be assumed, from a more recent source:—

> " It does not seem to matter what concessions are made by employers, they may pay trade union wages, and they may concede the eight hours' day, but so long as they require a fair day's labour in return they are treated as enemies of the working man. The present Government is, in some quarters, considered too favourably disposed towards the working classes of the country. This opinion, however, does not appear to be shared by the representatives of labour, if Mr. Barnes correctly voices their views. In a short speech he made at the recent opening of the Co-operative Printing Society's Works in Manchester, he criticised the Government because there is a tendency to introduce the system of speed and feed checking into the State workshops. Here, then, we have a representative trade unionist, whose past experience seems to teach him nothing, objecting to machines being worked at their maximum output, notwithstanding the fact that the men who tend them are paid the trade union rate of wages, and work trade union hours."

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Dealing with Redundancy

IN "Views on the News" in the *Electrical Review* of 26th July there was an item dealing with economy in the Post Office. The Post Office is like the London Electricity Board. No matter how much it reorganises or mechanises, it never declares anyone redundant. Men are just downgraded and paid the same salary until they die or retire. Would it not be better to do as is being done for the Services, compensate them for years of service and loss of pension instead of fitting square pegs into round holes?

Carrying on in this fashion will never get rid of dead wood; it means that the employee is overpaid for the unsuitable job he has been given and in which he will obviously never be happy.

"LONDONER."

Induction Motor Protection

IN his article reviewing the subject of protection from the point of view of control gear manufacturers and supply engineers Mr. J. H. Toule tends to give erroneous impressions of the current rules regarding overload capacities of motors and the overload setting of control gear. The discrepancies have arisen partly by failure to refer to the latest B.S. publications on the subject. For motors, reference is made to B.S. 2613:1955 which has since been superseded by B.S. 2613:1957 published on 29th March, 1957, and no reference is made to the latest version of B.S. 587:1957, published on 20th February of this year and covering motor starters and controllers.

In referring to B.S. 2613, "The Electrical Performance of Rotating Electrical Machinery," it is stated that this specification allows 25 per cent overload continuously. This is quite incorrect. The 1955 version allowed a 25 per cent overload on ventilated motors only for periods varying from 15 min to two hours, depending on the size. This overload rating applied only to machines up to 50 h.p. per 1,000 r.p.m.* Even that section has now been eliminated so that all motors, other than those of short-time rating, made to B.S. 2613:1957 are continuous maximum rated, i.e. no sustained overloads are permitted.

In discussing overload settings, on page 211, a statement is made that there should be no need to use a setting of less than 125 per cent; this appears to ignore the statement in the latest B.S. 587 that electromagnetic overload devices should be capable of being set at 15 per cent above the full load current of the motor, and also that any higher settings should be treated with caution since the overload devices and the motor may not be capable of carrying higher currents for any considerable time. (See section 7.17.1.)

It is felt that attention should be drawn to the fact that it is not standard motor application practice to use up any margin between an average ambient of, say, 15 or 20 deg C and the allowed limiting ambient of 40 deg C which is assumed in B.S. 2613, nor to increase deliberately the measured winding temperatures and hot spot temperatures beyond the normal limits, accepting at the same time the resulting reduction of life.

With reference to the overload capabilities of motors in general it would seem obvious that motors are bound to vary considerably in respect of their ability to withstand overload. The comparison of a totally enclosed motor with a ventilated machine, made prior to 1955, will confirm this fact. It is felt that the choice of phraseology regarding modern designs is regrettable. The statement that "unfortunately, modern motors are designed to the limit" is taken as an unnecessary and irrelevant criticism of the progress and advancement in motor design techniques. It is to the credit of the motor industry that efficient designs are available to-day which make the fullest possible use of material and which therefore tend to conserve the country's raw materials and keep down the selling prices.

Menston, Leeds. P. FIRTH, B.SC., A.M.I.E.E.

*[This point has been brought to our attention by Mr. J. F. Stanley, divisional chief technical officer, British Standards Institution, who also reminds us that in smaller motors (1-4 h.p.) the period of overload allowed was only 15 minutes. —Editors, *Electrical Review*.]

THE article by Mr. J. H. Toule raises many interesting points that have long been the subject of discussion among electrical engineers.

It is unfortunate that the author should have used B.S. 2613:1955 as a reference, as this has been superseded by B.S. 2613:1957. Motors designed to B.S. 2613:1957 have a continuous maximum rating and therefore no overload rating. In these circumstances it may be found that overload settings of 125 per cent are too high and this condition is referred to in the revised B.S. 587.

The final winding temperatures quoted by Mr. Toule are at variance with the current B.S. in which permitted temperature rises, assuming the temperature of cooling air at 40 deg C, are:—Class A, 55 deg C; Class B, 75 deg C; Class H, 115 deg C.

I would close by asking whether the author has considered the use of thermal protection units taped to the motor windings, thereby giving a true measure of the winding temperature.

Sevenoaks. H. KLINE.

Mr. Toule has seen copies of the above letters and replies as follows:—

In reply to the letters of Messrs. Firth and Kline, it is perhaps unfortunate that a new B.S. was introduced long after the article had been submitted to the publishers. Nevertheless, there are thousands of motors wound to the original specification still in commission and it is to these motors that the article was intended to apply.

It may not be standard practice to increase the temperature rise margins allowed by B.S. 2613, but tests by the author on a large number of motors have indicated that it is perfectly safe to do so in the majority of cases, provided that the winding hot spot temperature does not exceed 105 deg C.

Mr. Firth condemns my statement that "unfortunately modern motors are designed to the limit." This was not intended as a criticism of manufacturers. On the contrary, as Mr. Firth himself points out, it is a result of utilising materials to the maximum capacity. What my statement does imply is that it is unsafe to raise the overload settings

of modern motors indiscriminately. Surely this is borne out by the new B.S. 2613.

In my opinion, indiscriminate tripping of motors on light overload settings has cost the users far more than the reduction in life caused by using settings of 25 per cent overload. It is up to the user to decide whether to accept a reduction in motor life. This is the theme behind the article.

Bristol. J. H. TOULE.

IN your issue of 2nd August, Mr. Toule in his article concerning motor protection looks at the problem from a purely technical viewpoint and his remarks are not meant to deal with comparative costs of various forms of reliable protection. That would be fair enough if the subject had been treated a little more fully, but accompanied by very general statements the author proceeds to discard one system and then another until apparently only one device is worthy of a place in a motor circuit.

There will be a large measure of agreement with his statement that a well-made bimetal thermal device has more consistent characteristics than its magnetic counterpart, but Mr. Toule attempts to destroy even this merit by adding that ageing of bimetal renders it inconsistent, quite overlooking the fact that pre-ageing is one of the processes of good manufacture.

Turning to the problem of single-phasing protection, one would gather from Mr. Toule's remarks, particularly the sentence " the (conventional) protective relay only reacts to the increase in the supply . . . " that no device other than the one named can react to an *absence* of current in one phase, whereas the well-known overload and single-phasing preventer made by E.A.C., who themselves are the pioneers of single-phasing protection, has always operated on this very principle.

St. Albans, Herts. C. F. JACKSON, M.I.E.E.,
Director,
Electrical Apparatus Co., Ltd.

New Trains for Piccadilly Line

A NEW type of Underground train which is intended as the standard for future replacements of London tube rolling stock, beginning with the Piccadilly and Central Lines, was demonstrated by London Transport earlier this week. It is the first of three seven-car prototype trains which will shortly enter passenger service on the Piccadilly Line. With the cars panelled in unpainted aluminium alloy, the train has an " all-silver " exterior, thus breaking away from the traditional red.

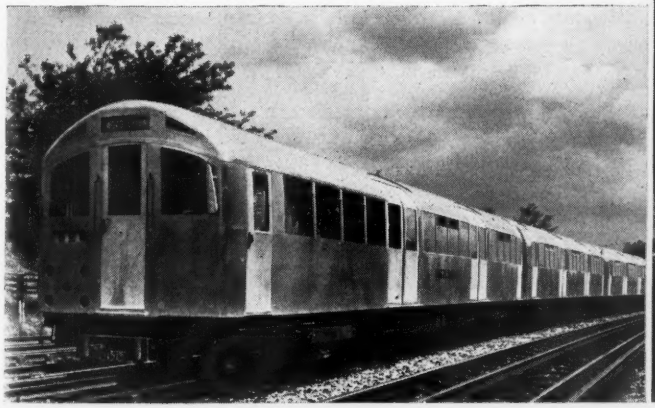
If the prototype trains prove satisfactory, the design will be used for the re-equipment of the Piccadilly and Central Lines, which as a result will have their passenger-carrying capacity increased. The provision of underfloor equipment will allow space for more seats per train than in most of the rolling stock at present in service on the Piccadilly Line.

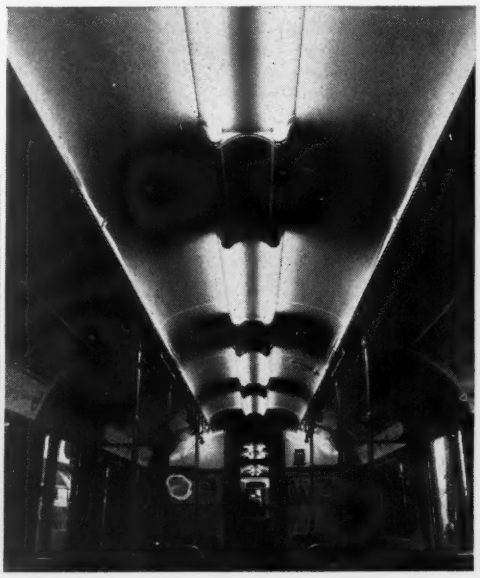
The three new trains have been manufactured, to the design of Mr. A. W. Manser, chief mechanical engineer of London Transport's railways, by the Metropolitan-Cammell Carriage & Wagon Co., Ltd., the Gloucester Railway Carriage & Wagon Co., Ltd., and the Birmingham Railway Carriage & Wagon Co., Ltd.

The design of the new cars follows standards incorporated in the 1938 tube stock, the major changes being the use of rubber springing for the bogie bolster and axle box suspension, the introduction of fluorescent lighting, and the panelling of the cars in aluminium alloy. Other changes include a better arrangement of transverse seats in the centre bay, and improved development of retractable shoe gear, a modified electro-pneumatic brake system designed to facilitate maintenance and improve reliability, and a roller blind destination indicator above the centre cab doorway illuminated by a fluorescent tube. Fluorescent lighting also illuminates the train number plate cabinet.

Features first introduced on the latest District Line

Below: Prototype " all-silver " rolling stock for London Transport's Piccadilly Line. Right : View of coach interior showing the centrally fitted fluorescent lighting





stock, such as trackless doors, mercury type door interlocks, door fault indicator lights, rubber window glazing, etc., which have proved their worth in service, have also been incorporated in the prototype tube trains. Opportunity has also been taken to try out two new types of motor-driven air compressors, both of which have been specially designed to fit in the very restricted space under a tube car.

To conform with the existing Piccadilly Line standard, each train consists of seven cars divided into four-car and three-car units, each unit being semi-permanently coupled. Each unit has a driving cab at both ends so that if necessary both can operate in passenger service, but full automatic coupling is provided only on the " inner " driving cars of a seven-car train which are to be known as " uncoupling driving motor cars " (" U.D.M.s ").

The design of the bogies closely follows that adopted on two advanced prototypes; these have already operated some 100,000 miles in passenger service under a 1938 tube stock driving motor car on the Piccadilly Line without any trouble being experienced or need for modification revealed.

To a large extent car body construction follows former practice except for the introduction of unpainted light alloy panelling in lieu of the former standard of steel sheet painted red. This results in a saving in weight with consequent reduction in energy consumption, a saving in paint, and lower cleaning costs.

Because of the restricted height available in a tube car the fluorescent lamps have been mounted as near the roof as possible and a special ceiling form has accordingly been evolved to suit. The 5ft fluorescent tubes are under-run so as to increase tube life with consequent maintenance economy. Emergency lighting is by four 45 W filament lamps; in the event of failure of the main lighting these lamps remain alight from the battery. Low-voltage a.c. and d.c. supplies are obtained from a Metropolitan-Vickers dual-purpose motor-generator set which is carried on the car underframe.

The traction equipment was supplied by the British Thomson-Houston Co., Ltd., and is of the P.C.M. type, which has been used extensively on the London Transport stock since 1938. The main resistors are of the light-weight coiled strip type. There are two G.E.C. axle-hung nose-suspended traction motors per motor car, each having a continuous rating of 575 V, 116 A, 80 h.p. on 66 per cent field. The motors are mounted on roller suspension bearings on the inner axles of each bogie, and drive through $7\frac{1}{2}$ deg helical gearing. The train performance, as regards speeds attainable, has been arranged to conform with existing stock with provision for improvement at a later date if required.

LONDON TRANSPORT OPERATIONS

IT is shown in the report of the London Transport Executive for 1956 that the gross receipts rose to £78,549,596 from the 1955 total of £74,200,462. To these revenue from advertising, the letting of sites, shops, etc., on the Executive's transport premises was added. The net revenue amounted to £4,546,854, against £4,969,863. This fall appears to have been due entirely to a large increase in bus and coach working expenses without a proportional increase in revenue, which reduced the net revenue from this section from £2,649,500 to £2,146,401. There were increases in the trolley-bus section (from £351,467 to £390,244) and in the railway section (from £1,968,896 to £2,010,209).

There was a fall of 4·4 per cent in the total number of passengers carried during the year (3,914 million) and one of 2·6 per cent in passenger-miles (10,840 million). The withdrawal of 170 trolley-buses (leaving 1,614 in service at the end of the year) is reflected in a reduction of 7·7 per cent (to 630 million) in the number of passengers carried and of 6·3 per cent (to 1,316 million) in passenger-miles. While the railways carried 0·4 per cent more passengers (678 million) the passenger-miles decreased by 1·6 per cent (to 3,413 million).

Consumption of electricity in 1956 amounted to 806 million kWh, an increase of only 1·1 per cent. Of this trolley-buses accounted for 179 million (a decrease of 2·8 per cent) and railways for 626 million (2·3 per cent increase). Per car-mile the consumption of trolley-buses was 2·81 kWh and that of the railways 3·13 kWh.

A new substation at Surrey Docks and the modernised Whitechapel substation came fully under remote control during the year. Three substations on the District Line are now being fed from the Greenwich power station and 8·5 miles of h.v. cable have been installed in this section. Details are given of signalling improvements and station works.

It was decided last year to complete the scheme for four-tracking the Metropolitan Aylesbury Line between Harrow-on-the-Hill and Watford South Junction and for extending electrification from Rickmansworth to Amersham and Chesham, work which was suspended during the war. It is expected that the work will begin next year and be completed in 1961; the cost is put at £$3\frac{1}{2}$ million.

The six-mile outer section of the Central Line between Epping and Ongar is being electrified this year at a cost of £100,000. Construction was begun last year of a new District Line rolling stock depot at Upminster in connection with the electrification of the Eastern Region's London, Tilbury and Southend Line.

Research work has resulted in the adoption of a modified design of lead-acid battery for buses and coaches which will reduce maintenance costs. " Demineralised " water is now used for topping-up accumulators on road and rail vehicles. Other matters which have been investigated include the interior lighting of buses, the cost of generating electricity on buses operating in service and the stress loading of a motored axle. In the last case preliminary results have shown that the maximum stresses arise from local irregularities in the running edge of the rail, particularly on curves, and not, as was formerly supposed, when passing over points and crossings. Investigations are continuing with test equipment of more advanced design.

Electrical Engineering Courses

A number of courses in the various branches of electrical engineering commence at the South East London Technical College in October next. They cover high voltage engineering, transistor physics and transistor applications, nuclear physics, electric circuit theory, and electric power transmission calcualtions. Particulars can be obtained from Mr. C. W. Robson, head of the Department of Electrical Engineering and Applied Physics, Lewisham Way, S.E.4.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. W. S. Veness, for many years lighting engineer for Metropolitan-Vickers, London Region, before the A.E.I. Lamp & Lighting group amalgamation, has now retired and joined the staff of Halsey's Electric Co., Ltd. Mr. Veness is well known in the lighting world, and is a past-president of the Lightmongers' Society, and one of its founder members.

Mr. W. S. Veness

Mr. J. N. M. Legate, B.Sc., A.M.I.E.E., whose article on present day trends in the control of rotating electrical machinery appears in this issue (page 267), received his technical education at the Imperial College of Science and Technology, City and Guilds (Engineering) College. On completing a college apprenticeship course with Metropolitan-Vickers he joined the company's Industrial Control Sales Department as a junior engineer. From 1947 he specialised in electronic control, and from 1953 assisted the sales manager of the Industrial Control Department. In 1955 he was appointed to his present position as assistant chief engineer, Industrial Control Department.

Mr. J. N. M. Legate

Area inspecting engineers of the **National Inspection Council** recently attended a meeting of the Council held in London, at which Mr. C. R. King, C.B.E. (chairman) and officers at headquarters were present. The accompanying photograph was taken during the meeting. In the group are:—

Back row: Messrs. E. W. Roper (Midlands), R. A. Headland (East Midlands), H. C. Breeze (Eastern), T. Howell (Southern), D. B. T. Williams (South Wales).

Centre row: Messrs. A. Kay (Merseyside and North Wales), H. F. Smith (North Western), R. E. M. Hunter (South Eastern), J. Pidgeon (North Eastern), P. Laughton (Yorkshire), H. J. Slaughter (South Western) and M. Kerr (Scotland—South and West).

Front row: Mr. P. G. Wallis (part-time adviser), Brig. W. G. S. Thompson (chief executive and secretary), Messrs. C. R. King (chairman), E. J. Sutton (chief technical officer) and J. J. Looker (London).

Area inspecting engineers and officers of the National Inspection Council

The Stabilag Co., Ltd., has appointed **Mr. E. H. Salmon** as commercial manager. Mr. Salmon joined the company from an overseas administrative post.

Mr. E. H. Salmon

The Eastern Electricity Board has appointed **Mr. H. Inman** as senior assistant engineer in the Tariffs and Economics Section of the Chief Commercial Officer's Department. Mr. Inman started his career in the electricity supply industry at Thornhill power station, near Dewsbury, and later served as sales engineer with the Yorkshire Electric Power Co. On nationalisation he was for three years technical assistant to the manager of the Wakefield Sub-Area of the Yorkshire Electricity Board before joining the Eastern Board.

At a recent sales conference of the **London Electric Wire Co. & Smiths, Ltd.,** and associated companies held at Eastbourne, Mr. E. L. Wildy, chairman and managing director, presented

Mr. L. Coope receives the Lewcos turnover award from Mr. E. L. Wildy

the inter-branch turnover competition award to Mr. L. Coope, who received it on behalf of the Manchester branch.

OBITUARY

Mr. Gerald R. Blackburn, formerly chief engineer of the Manchester Corporation Transport Department, died last month, aged eighty-four, after a short illness. He was a former member of the Institutions of Civil and Electrical Engineers and was educated at Bradford Grammar School and the Yorkshire College (now Leeds University).

Mr. Blackburn served with the Bradford Corporation and later the Manchester Corporation in the pioneer days of the electric tramcar, over fifty years ago. He served on many British Standards Committees when tramcar standards were first drawn up. He retired in 1934. His only son, Mr. M. G. Blackburn, J.P., M.A., B.Sc., is statistics officer to the South Western Electricity Board.

Mr. W. T. Anderson, M.I.E.E., M.I.Min.E.—The death occurred on 8th August of Mr. William Thomson Anderson, late contract consulting engineer to W. T. Glover & Co., Ltd. Mr. Anderson, who was eighty-seven, was born in Manchester and received his education at Manchester Grammar School and at King William's College, Isle of Man. He served an apprenticeship as a mechanical engineer with John Hetherington & Sons and in 1893

joined F. H. Royce & Co., Ltd., as an outside erector, later spending some five years in Mexico for that company.

He entered the service of W. T. Glover & Co. as contract engineer in 1901, becoming contract consulting engineer and mining specialist in 1910. In this latter capacity he was closely associated with the late Mr. J. A. B. Horsley, Chief Electrical Inspector of Mines, during the initial introduction of electricity to mining. Mr. Anderson retired in 1941. He was one of the founders of the Association of Mining Electrical Engineers, and became national president of the Association in 1923-24.

Mr. Lancelot P. Tappin, A.M.I.E.E., district commercial engineer in the Barnard Castle area (Co. Durham) of the North Eastern Electricity Board, died recently while on holiday in Derbyshire.

Mr. Vivian James Foxton Brain, B.E., M.I.E.Aust., M.I.E.E., M.A.I.E.E., chairman of the Electricity Authority of New South Wales and vice-chairman of the Electricity Commission, whose death at the age of sixty we briefly reported in our issue of 2nd August, was educated at Sydney Grammar School and later graduated with first class honours in electrical engineering at Sydney University. He interrupted his university studies in the 1914-18 war to join the A.I.F. and served in France.

The late Mr. V. J. F. Brain

After graduation Mr. Brain went to the United States where he worked for the American General Electric Co., the Alabama Power Co. and the New York Edison Corporation between 1922 and 1929. On his return from America in 1929 Mr. Brain was appointed chief electrical engineer of the Department of Public Works, and among his achievements during this period was the noteworthy contribution to country electrification made by the development of the Southern Electricity Supply system. During the last war he was Regional Controller of Electricity. In 1946 Mr. Brain was appointed as chairman of the Electricity Authority of New South Wales and later, in 1950, as vice-chairman of the Electricity Commission, serving in these capacities until his death.

As one of the foremost electrical engineers in Australia, Mr. Brain's interests were wide. He was a member of the Scientific Advisory Committee of the Atomic Energy Commission. He represented the Authority and the Institution of Engineers, Australia, on the Australian National Council of C.I.G.R.E. and he was also the chairman of the Australian National Committee of World Power Conference from its inception in 1929 until his death. He was president of the Institution of Engineers, Australia, in 1951, and was an overseas representative of the Institution of Electrical Engineers, London.

Mr. R. P. B. Voaden, B.Sc., A.M.I.E.E.—The death has occurred while on holiday at Luino, Italy, at the age of fifty, of Mr. Richard Philip Ball Voaden, regional manager, A.E.I. Lamp & Lighting Co., Ltd., Birmingham. Educated at Okehampton Grammar School and afterwards apprenticed with the British Thomson-Houston Co., Ltd., Rugby, Mr. Voaden studied at the same time at the Rugby College of Technology where he obtained his Bachelor of Science degree. He joined the company's Birmingham office in 1933 and took charge of the Cambridge sub-office in 1949. He returned to the Midlands in 1953 to become assistant manager of the Birmingham district office and in 1955 he was appointed regional manager to the A.E.I. Lamp & Lighting Co. He was a member of the Birmingham Electric Club.

The late Mr. R. P. B. Voaden

Mr. Voaden leaves a widow, two sons and a daughter. The funeral took place on Tuesday last at Solihull Parish Church.

WILLS

Viscount Cherwell, P.C., C.H., of Christ Church, Oxford, formerly Professor of Experimental Philosophy at Oxford, personal scientific adviser to Sir Winston Churchill when Prime Minister, and a member of the United Kingdom Atomic Energy Authority, who died on 3rd July last, left £101,391 gross (£98,131 net).

Mr. G. E. Jewell, a director of the London Electric Wire Co. & Smiths, Ltd., and the Liverpool Electric Cable Co., Ltd., who died on 6th May last, left £8,653 gross (£4,751 net).

Mr. J. A. Lee, O.B.E., M.I.E.E., A.M.I.Mech.E., transmission consultant to British Insulated Callender's Construction Co., Ltd., who died on 9th November last, left £7,067 gross (£7,005 net).

Mr. A. T. Brotherton, J.P., formerly a director of the Brush Electrical Engineering Co., Ltd., who died on 16th April last, left £50,403 gross (£50,316 net).

Regent Street Re-Lighting

A new street lighting installation is now in operation in Regent Street, London, between Piccadilly Circus and Oxford Circus. It consists of 46 G.E.C. "Four-Eighty" lanterns each housing four "Osram" 5ft 80 W "warm white" fluorescent tubes. The lanterns are opposite-mounted at 120ft spacings at a height of 25ft on steel columns fitted with specially designed ornamental cast iron bases. The light from the tubes is controlled by refractor plates sealed into a "Perspex" bowl. The lantern body is of modern design incorporating concealed hinges and catches supporting the optical system. The side entry bracket is concealed entirely within the body of the lantern.

Additional lighting is supplied by specially designed G.E.C. vertical mounting lanterns each housing four "Osram" 2ft 40 W fluorescent tubes and mounted at a height of 15ft on steel columns erected on the existing island refuges in the centre of the street.

The installation was carried out by the mobile erection squad of the General Electric Co., Ltd., in co-operation with the London Electricity Board and planned in collaboration with Mr. A. W. Hogg, B.Sc., A.M.I.C.E., M.I.Mun.E., engineer and surveyor to Westminster City Council.

G.E.C. lighting installation in Regent Street, London

INDUSTRIAL NEWS

Electricity Regulations

The Electricity (Central Authority and Area Boards) Regulations, 1947, deal with the terms of appointment and tenure of office of members of the Central Authority, other than the chairman of the North of Scotland Board, and of members of Area Boards, other than the chairman of the Consultative Council for the area concerned, the conditions under which the Minister may declare the office of a member vacant and the quorum and proceedings of the Authority and Area Boards. Provision is also made for the disclosure to the Minister of information about certain business interests of such members.

The Electricity (Central Authority and Area Boards) (Amendment) Regulations, 1957 (S.I. 1957 No. 1382, H.M. Stationery Office, price 3d) made by the Minister of Power amend those regulations so as to apply their provisions to the Electricity Council and the Central Electricity Generating Board set up under the 1957 Act. They also extend to members of Area Boards who are chairmen of Consultative Councils the duty as to disclosure of information and include additional provisions in relation to proceedings.

Under Section 1 of the Electricity Act, 1957, the Central Authority will cease to exist on 1st January, 1958, when the provisions of those parts of the regulations applicable to them will no longer have effect.

Electricity Supply Salaries

At a special meeting on 1st August the National Joint Council (Administrative and Clerical Grades), Electricity Supply Industry, approved a further revision of salary scales to take effect from 1st March last. One scale for the general clerical grade now takes the place of the existing general clerical and higher general clerical scales and Grade 10 (£1,425-£1,545) is added to cover cases in which Grade 9 is considered to be insufficient to cover additional duties and responsibilities.

The other scales cover shorthand typists, machine operators, assistant demonstrators, telephone operators, women tracers, draughtswomen, and State enrolled assistant nurses.

All-Electric Bakery

Automation and pre-set electrical devices control and operate the new £250,000 Co-operative Society bakery at Taunton, which is one of the most up-to-date of its kind in the country and produces 240,000 loaves a week. There are 75 electric motors operating machinery—36 in the bulk flour plant and 39 on the production side, ranging from ¼ h.p. to 60 h.p. The whole process of dough-making is controlled by one man operating an electric control panel. The South Western Electricity Board has installed a new 11 kV substation at the bakery where the supplies of electricity are stepped down to standard 415/240 V, 3-phase, 4-wire.

Water Turbines for America

The English Electric Export & Trading Co., Ltd., has received from the U.S. Army Corps of Engineers a further order for Table Rock power station, White River, Missouri. The new contract is to supply Nos. 3 and 4 water turbines. The first two turbines of similar design and power were ordered from the English Electric Export & Trading Co., Ltd., in November, 1954, and are now nearing completion in the company's works at Rugby and Netherton, near Liverpool. The output of the water turbines is 68,000 h.p. at 128·6 r.p.m. under a 190ft head and they are of the vertical Francis type. The value of the latest contract is in the region of $1,400,000. The turbines will be built to designs made at the headquarters of the company's water turbine division at Rugby.

Sydney-Lithgow Electrification

For the electrification of the main line from Parramatta, near Sydney, New South Wales, and Lithgow, in the Blue Mountains (*Electrical Review*, 9th August, page 248) forty 3,820 h.p., 108-ton electric locomotives are being supplied by the Metropolitan-Vickers Electrical Co., Ltd. They have to cater for passenger trains up to a maximum speed of 70 m.p.h. as well as heavy freight trains working over the Blue Mountains and are capable of being operated in multiple, both for motoring and for regenerative braking. The line, which is electrified at 1,500 V d.c., climbs to a height of 3,500ft above sea level and follows a single narrow sandstone capped ridge and severe curvature is encountered in many places.

The locomotives are each fitted with six traction motors, giving a starting tractive effort of 61,000 lb. The motors and main starting resistors are force ventilated. The resistor fans are designed to start blowing 1 min after starting and to stop 3 min after all resistance has been cut out. The control scheme uses electro-pneumatic switches operated at 120 V; transitions from series to series-parallel and from series-parallel to full-parallel are carried out by the short circuit method, while transitions from parallel to series-parallel, and series-parallel to series employ the open circuit method. The starting resistance is cut out in nineteen stages in the series connection, in eighteen stages in series-parallel, and in seventeen stages in full parallel. Five extra running speeds can be obtained in each combination by weakening the motor fields, giving a total of eighteen economical running notches.

Sydney - Lithgow 'main line electrification': a passenger train headed by one of forty 3,820 h.p. 108 ton Metropolitan-Vickers electric locomotives at Woodford station. (Photo reproduced by permission of New South Wales Government Railways)

Irish Import Levies Removed

The following goods have been freed by the Irish Government from the special import levies which were imposed in March, 1956, in order to remedy the balance of payments position:—Electric handlamps and torches; light fittings and bulbs for medical, surgical or scientific purposes or stage lighting; certain X-ray films; electro-thermic and electro-mechanical appliances for use in hotels, restaurants and institutions.

An official statement said that it was hoped that the removal of the levies on certain appliances for hotels, etc., would act as an encouragement for the increased adoption of up-to-date and efficient methods.

"Electricity for Everywoman"

This is the title of the campaign now being "waged" by the Electrical Association for Women (25, Foubert's Place, London, W.1). One aspect of this is the publication of several booklets each (with the exception of the first) aimed at a particular section of the feminine half of the nation. The first, "Electricity for Everywoman," is of a general nature and it sets out the many advantages of electricity in a succinct fashion, conveying a brief

idea of the way in which electricity is generated and distributed. The necessity for adequate installations is particularly stressed and on the back of the booklet (as on all the others) is an "Electrical Ready Reference" giving particulars of the consumption of electrical appliances.

At present three other booklets are available, addressed to the countrywoman, the teacher and the woman gardener. Four more are being introduced—for the townswoman, the nurse, the elderly and the disabled. Copies of all of the booklets are obtainable from the E.A.W. at 1d each, plus postage.

Contract for New Australian Power Station

The State Electricity Commission of Victoria, Australia, has placed an order for Yallourn "E" power station with Australian Electrical Industries Pty., Ltd., acting on behalf of the Metropolitan-Vickers Electrical Export Co., Ltd. The power station will have an output of 240 MW, and the order, which is worth £4,400,000 sterling, is for the complete power station with the exception of the boilers and coal handling plant. Equipment to be manufactured at the Metropolitan-Vickers Trafford Park works will be to the value of £2,500,000 sterling, principal items being the turbo-generator sets and the main transformers.

The two turbo-generator sets will each have an output of 120 MW at 13·8 kV three-phase 50 c/s and will comprise hydrogen-cooled generators direct coupled to turbines running at 3,000 r.p.m. The turbines, of two-cylinder close-coupled construction, will be non-reheat machines with inlet steam conditions of 1,500 lb/sq in and 1,050 deg F.

The main transformers will comprise two three-phase groups of single-phase units to step-up the generator voltage to the 345 kV transmission voltage. This output voltage is as high as for any power transformers ordered from British manufacturers. Initially the transformers will supply power at 230 kV, and the change-over to the higher voltage will be made by means of adjusting links. Off-circuit adjusting tappings will be provided on the 345 kV windings at $-2\frac{1}{2}$, 5, $7\frac{1}{2}$ and 10 per cent.

Printed Circuit Telephone

A new telephone of particular interest to overseas telephone administrations, but also available to users of private telephone equipment in this country and abroad, has been developed by Siemens Edison Swan, Ltd. It is the "Centenary Neophone," the first printed circuit telephone, which has been "styled" by one of Britain's leading industrial designers.

Both case and handset are moulded in high impact-resisting plastic. The handset, which incorporates a new ring type receiver for better speech reproduction and weighs only 7 oz, is available in a wide range of pastel shades—ivory, deep maroon, bright red, green, dark grey and oatmeal—as well as the familiar black. The telephone case is available in black, ivory and pale grey, thus providing 21 alternative colour combinations. The flexible cords are all black.

In the new design dust collecting ledges have been eliminated and the curved handset has a new hygienic mouthpiece. Improved rubber feet each consisting of a series of concentric gripping edges anchor the instrument firmly to the table during dialling, an important point in view of the fact that the weight of the instrument with the handset removed is only 3 lb.

An annular depression in the case, round the dial switch, provides space

Siemens Ediswan "Centenary Neophone"

for an additional letter-ring for use in director exchange areas, enabling the characters to be displayed in large bold type. This arrangement also gives a much wider angle of vision, since the letters do not have to be viewed directly through the holes in the finger plate.

For maintenance purposes the case is quickly detachable and the printed circuit technique ensures that when any component has to be replaced correct connections are re-established automatically.

The terminal block measures only $1\frac{7}{8}$in by $1\frac{3}{8}$in by $\frac{5}{8}$in and is thus relatively inconspicuous.

Television Sets and Fire Hazard

Television sets which were left switched on at the mains were stated by a Fire Brigade officer to be a source of risk when he gave evidence at an inquest at Bristol last week on a man and his wife who died in a fire at their home.

Divisional Officer L. Walsh, of the Bristol Fire Brigade, said there could have been three possible causes of the fire. The television set lead and the transformer were "live" because the set had not been unplugged and the plug was in the "on" position. A second possible cause was a temporary lighting arrangement from the living room to the kitchenette, passing through a door, and a third was a possible fault in a wall plug controlling the living-room overhead light. In reply to the Coroner, he said that there was nothing definite to suggest that the television set was the source of the fire, apart from conjecture.

He agreed that a large number of television and radio sets were kept in that position, but said there was nevertheless a danger of some short-circuiting which could start a fire in any television set left on at the mains.

The Coroner, who said there was no evidence to convince him how the fire really started, recorded verdicts of "Accidental death."

Applications of Vibrators

For the benefit of designers and commercial users, the Plessey Co., Ltd., has issued a new publication on vibrators which caters for the great majority of possible applications. Codings have been carefully devised so that the characteristics of vibrators can be identified by means of letters and figures which have been incorporated in a separate table for easy reference. Complete specification details and a short descriptive note on the application of vibrators are provided. In addition to illustrations of some of the components associated with vibratory power pack design, a separate section of the new publication contains schematic, waveform, and pin connection diagrams and useful technical information for designers. Copies are available to design engineers from the Sales Department, Components Group, Plessey Co., Ltd., Ilford, Essex. Overseas inquiries should be directed to Plessey International, Ltd., at the same address.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical

ALUMINIUM ingots	ton	£197 0s 0d
COPPER, H.C. Electro	ton	£209 17s 6d
Fire Refined 99·70%	ton	£208 0s 0d
Fire Refined 99·50%	ton	£207 0s 0d
COPPER Tubes ..	lb	2s 0½d
Sheet	ton	—
H.C. wire and strip ..	ton	—
LEAD, English ..	ton	£91 12s 6d
Foreign	ton	£90 0s 0d
MERCURY	flask	£87 0s 0d
TIN, block (English) ..	ton	£738 15s 0d
ZINC, G.O.B. Foreign	ton	£73 5s 0d
Electrolytic	ton	—
BRASS Tubes (solid drawn)	lb	1s 8⅝d
Sheet	ton	—
Wire	lb	2s 5½d
PHOSPHOR BRONZE Wire	lb	3s 9¼d
PLATINUM	oz	£31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb	26¼d—27¼d

industry. The figures given are the selling prices and are those quoted on Tuesday last.

Space Heating and Fire Precautions

The Fire Protection Association, 15, Queen Street, London, E.C.4, has issued a booklet entitled "Space Heating" in which the subject is con-

sidered under the categories of central heating, open fires and slow combustion stoves, radiant heaters, and convector heaters. Under each category the use of all forms of fuel is dealt with and safeguards against fire are discussed. The booklet is obtainable from the Association free of charge.

Last Calder Hall Heat Exchanger Erected

A series of intricate "heavy lift" operations was completed on 8th August when the last of the sixteen heat exchangers to be installed at Calder Hall nuclear power station was hoisted into position. These heat exchangers weigh 178 tons each; they are 80ft high and have a diameter of 17½ft. They had to be lifted from a horizontal position on the ground on to a 16ft high concrete plinth. After being hoisted upright each was bolted into position to an accuracy of one-eighth of an inch. The erection of the heat exchangers has been carried out over a period of about three years by the constructional division of Costain-John Brown, Ltd., and considerable planning was needed prior to the hoisting operations to avoid interfering with other construction work going on at the power station.

The exchangers were fabricated on the site and had to be carried about one-quarter of a mile to each reactor house. The time taken from arrival at the erection site to the final dismantling of the "gin" poles which were employed in their erection was 22 days, but the actual "lift"—the crux of the operation—was carried out in a little over an hour.

Power Plant for Iraq

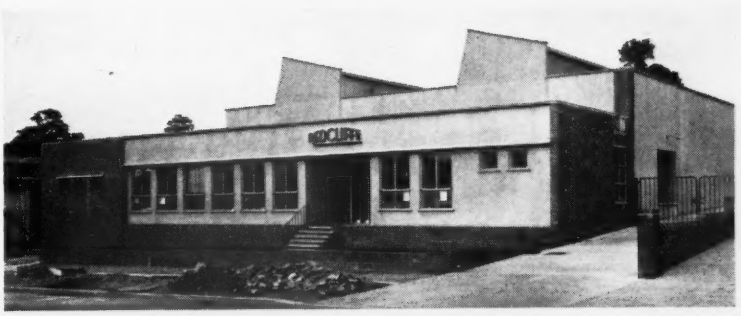
A B.U.P. message from Baghdad states that a £655,793 contract has been awarded to the Metropolitan-Vickers Electrical Co. for the supply of three turbo-generating units for a thermal power scheme at Basra, Iraq. The contract includes £18,237 for spare parts. The Iraq Development Board said the award was made on the basis of a "suitable offer." The units will be ready for use late in 1959. The contract is the first awarded for the Basra scheme.

Australian Electrical Manufacture

In 1956 there was a further decline in Australian production of electrical appliances. The output of domestic refrigerators, after having increased by 31 per cent in 1954, declined by 19 per cent in 1955, and fell a further 16 per cent last year to a level of around 210,500. The reduction in the manufacture of washing machines was less severe, with production falling last year by 9 per cent. For radio receivers and radiograms the declining trend in output, although moderate during 1955, was particularly marked in 1956 with the advent of television and approximated 12 per cent. Television sets produced in July, 1956 (the first month for which official figures are available), numbered 3,100, and by November had increased to a monthly rate of 12,900, but declined in December to 10,400.

Generally, production of the smaller type of domestic electrical appliance expanded during the year, significantly in the case of electric irons and fans, and to a small degree in respect of toasters. Output of food mixers, which rose by 31 per cent in 1954 only to decline by 4 per cent in the following year, fell by 30 per cent in 1956.

Sales of domestic electrical appliances for 1956 totalled £106·7 million, 3·1 per cent more than the total for the preceding twelve months. However, this relative increase over the period was slightly less than half the rise recorded in 1955.



The new Bristol works of Redcliffe Industries, Ltd.

North Western Fuel Luncheon Club

The opening meeting of the 1957-58 session of the North Western Fuel Luncheon Club will be on 25th September at the Engineers' Club, Manchester. The principal guest will be Ald. L. Lever, Lord Mayor of Manchester.

Diploma in Technology

The following sandwich courses now in progress have been recognised as leading to the Diploma in Technology:—Loughborough College of Technology: Electrical engineering; production engineering. Northampton College of Advanced Technology, London: Applied physics; electrical engineering.

The National Council for Technological Awards has also approved the following new sandwich courses: Northampton College of Advanced Technology: Industrial chemistry; mechanical/production engineering.

Varley-Redcliffe Transformers

The Varley Magnet Co., which is incorporated in Oliver Pell Control, Ltd., has come to an arrangement with Redcliffe Industries, Ltd., whereby the production of its range of "Varley" industrial transformers has been transferred to the newly erected factory of Redcliffe Industries, Ltd., at Bristol. The joint range of transformers will be known as "Redcliffe" transformers and will be marketed in future through the technical sales organisation of Oliver Pell Control, Ltd. Correspondence, inquiries and orders for transformers should be addressed to Redcliffe Industries, Ltd., Emery Road, Brislington, Bristol, 4 (telephone: Bristol 77431/2).

Electronics and Automation Exhibition

The next Instruments, Electronics and Automation Exhibition will be held from 16th to 25th April, 1958 (not 16th to 18th April as stated in our last issue), at Olympia, London . A conference will be held simultaneously with the exhibition.

Trade Announcements

The British Radio Corporation, Ltd., announces that E.M.I. Sales & Service, Ltd., have ceased to act as distributors of "His Master's Voice" and Marconiphone radio receivers, radiogramophones, television receivers and record reproducers. With effect from 1st August these products are being distributed through two new companies with sales offices and showrooms at 21, Cavendish Place, London, W.1. These are "His Master's Voice" Radio & Television Sales, Ltd., and Marconiphone Radio & Television Sales, Ltd., the directors in both cases being Messrs. F. W. Perks, S. T. Holmes and G. J. Strowger.

New London showrooms will be opened on Monday next by **Philip S. Schulman, Ltd.,** lighting fittings manufacturers, of Manchester, at 40, Redchurch Street, Shoreditch, E.2 (telephone: Bishopsgate 7079).

Anders Electronics, Ltd., has taken additional office premises at 103, Hampstead Road, N.W.1. The dispatch department and warehouse are at 91, Hampstead Road, N.W.1. The telephone number is still Euston 1639.

The **Solartron Electronic Group, Ltd.,** Thames Ditton, Surrey, has decided to sell no longer through agents in the United Kingdom. In future, all inquiries should be sent direct to the Group at the Thames Ditton headquarters.

Albert Taylor (Manchester), Ltd., have been appointed area stockists for Manchester, East Lancashire and East Cheshire for insulating varnishes, enamels and thinners manufactured by Griffiths Brothers & Co. London, Ltd.

SCIENCE in INDUSTRY

Work of the Department of Scientific and Industrial Research

THE 41st report of the Committee of the Privy Council for Scientific and Industrial Research, which was published on 8th August (314 pages, H.M. Stationery Office, 9s 6d), relates to the twelve months ended 30th September, 1956. It records that under the Act of August, 1956, the former Advisory Council was succeeded by the Research Council, which took office as the executive body on 7th November last under the chairmanship of Sir Harry Jephcott with Professor H. W. Melville as secretary. Expenditure by the Department for the year ended 31st March, 1956, amounted to £6·4 million compared with £5·9 million for the previous corresponding period.

The report is devoted mainly to accounts of investigations carried out in the Department's establishments and by grant-aided co-operative organisations. Among the latter is the British Electrical and Allied Industries Research Association (E.R.A.), which is to receive a block grant of £100,000 for each of the two years 1957 and 1958 provided £200,000 is contributed by industry.

About 15 per cent of the current E.R.A. programme has a long-term fundamental character, the remainder being concerned with applied research on materials, on design, construction and operation of finished products used in the operation, co-ordination and utilisation of electrical systems. A report has been completed on creep and stress relaxation at steam conditions of 1,050 deg F and 1,500 lb/sq in, as derived from tests of 20,000 to 30,000 hours' duration on superheater-tube, steampipe and turbine steels. Preliminary results have been given for determining the properties of steam up to 6,000 lb/sq in and 1,400 deg F (obtained from plant at Imperial College, London). Properties of titanium alloy for highly stressed turbine components are now under investigation.

Fuel Cell Development

A specification for windmills of about 100 kW has been outlined. Work at Cambridge on the hydrogen-oxygen fuel cell has been brought to a stage at which it is suitable for industrial development, for which arrangements are being negotiated.

Results of full-scale tests on the steady-state and transient stability of the 132 kV grid are being compared with those obtained by prior analysis. Further units of the network analyser are under construction. Methods for rapid and accurate evaluation of transfer functions of complex networks and amplifiers are now in use and the equipment has been applied to problems of frequency response and transient behaviour, including that of heat flow in two dimensions.

Equipment provided for studying a possible cheapening of overhead lines by increasing tensions nearer to the failure limit due to vibration includes a 16-channel magnetic tape recorder, which can run continuously for fifteen days. The first stage of an investigation at Queen Mary College on the efficiency of devices for protecting insulators against the effects of power arcs has been completed.

Two new numerical methods for facilitating accurate calculations of cyclic rating factors and short-time peak ratings of cables are regarded as contributing substantially towards their utilisation to maximum advantage. The programme includes field tests on limitations on thermal dissipation due to moisture movements in soils. Short-circuit ratings of multi-core cables up to 11 kV as imposed by temperature limits, caused by thermo-mechanical forces, have been determined, as have continuous ratings for armoured cables and multi-core cables in conduit at 400 c/s.

Gas-Discharge Phenomena

Recent advances in knowledge of gas discharge phenomena have shown that higher temperatures occur in the steady-state arc than had been supposed; this has important consequences for arc welding and for chemical spectroscopy. Dynamic arc theory has been used to explain contradictory results obtained by other investigators on post-zero conductance in air-blast circuit-breakers. New studies regarding circuit interruptions *in vacuo* show promise of these being applicable to high and low power switchgear, contactors and rectifiers. Substantial advances relating to the factors responsible for wear of contactor surfaces is reported.

Possible hazards from flameproof oil-filled switchgear are being subjected to proof and the possible use of modern cements and gasket materials are being considered. A continuous recorder of surges due to lightning and switching has been installed on a 33 kV system with resistance earthing and will be transferred later to an 11 kV system with arc-suppression coils.

Experimental data on the distribution of surge voltages in transformer windings have been shown to agree with general theoretical treatment. Stray load losses due to the radial component of leakage flux have been calculated and the extra losses at joints in cores of anisotropic steel are under investigation. Digital computers have made possible more accurate mathematical calculations of short-circuit forces with various types of winding and of very large ratings. (Increasing use of computers in other industries is also referred to.) Different methods of drying large transformers during manufacture and speeds of re-adsorption of moisture before and after oil impregnation are being compared.

Electricity in Agriculture

Long-term work continues on rural electrification, such as crop drying, effects of electricity on plant growth, soil warming, irradiation with light, soil moisture content, destruction of pests in grain and timber by high-frequency radiation and on farm applications of heat pumps. Performance data regarding the last-named for domestic uses, together with floor heating, have been collected for domestic uses, while new programmes have been started on heat transfer from frost-covered evaporator surfaces, on domestic drying of laundry and on scale formation on immersion heaters.

Co-operation with the British Welding Research Association has enabled electrical characteristics of the self-adjusting arc, used for welding aluminium in an argon-gas shield, to be related to the practical quality of the weld, thus greatly extending the range of application of this metal.

Strong correlation has been found between moisture

content and discharge-inception stress in impregnated paper insulation and this result is being used in a study of capacitor life. Sufficiently dry samples are withstanding three times the normal working stress. An industrial method of measuring resistance to ionic discharges as a property of dielectric material, which is the outcome of earlier work on the mechanism of electrical failure, is expected to be adopted internationally. The discovery of a new mechanism of failure at high field strengths, depending on the mechanical force exerted by the field, has led to revision of some ideas on intrinsic strength.

Short-wave variations from h.f. electrical discharges is being investigated as a possible alternative to chemical methods of polymerisation. Study of ferro-electric materials is being directed to sodium-potassium niobates, the electrical properties of which can be varied by changing the Na/K ratio. Temperature classification of such insulating materials as Terylene, nylon and cotton is being evaluated by thermal endurance tests of enamelled wires. Failure of rubber gloves has been shown to be of a thermal nature and to follow from water absorption in certain rubber constituents. Work continues on industrial insulating materials in connection with proposals for British Standards.

Apart from the E.R.A. activities outlined above, numerous references are made in the report to electrical or allied matters in other fields. It is stated, for example, that the publication of the 50,000-word document on automation in May of last year attracted more attention than any single event during the 40 odd years of the Department's existence. Under the heading of Building Research is mentioned the growing need for lightweight aggregate, to which sintered pulverised fuel ash from power stations is expected to make a useful contribution. Tests by Forest Products Research show radio-frequency heating to be completely satisfactory, compared with cold setting, in regard to change in strength with age of glue joints in wood.

Fuel Research

Intensified efforts are being made at the Fuel Research Station towards efficient utilisation of the more plentiful coals of small size and low quality so as to conserve the better (especially coking) varieties which are being more rapidly depleted. Ionising radiations from nuclear reactors may be used to enable processes now requiring high pressures or temperatures to be less expensively operated; a source of gamma radiation (Cobalt-60) has been installed in the fuel research station. Geological surveys are being carried out to discover sources of uranium, monazite and thorite in the Dominions and Colonies. Six abandoned mines in Cornwall with small uranium deposits are being used for testing new electronic instruments and exploration techniques and, in conjunction with the A.E.A. (Harwell), a new airborne scintillometer has been developed.

At the electricity division of the National Physical Laboratory a " surprising conclusion " has resulted from a study of cable breakdowns with hand-made samples. This reveals that the impulse strength is the same whether the conductor is stranded or smooth, a conclusion that " conflicts with theory and with limited published data on factory specimens."

High power electronic supplies derived directly from the a.c. mains for use in the frequency range 30 c/s to 5 kc/s have been developed in which the output voltage does not vary by more than 0·01 per cent over a period of three minutes. A portable instrument for measuring watts, volts and amperes at frequencies up to 20 kc/s, as suitable for induction heating, for instance, has been constructed. A larger insulator for the h.v. electrode of the absolute voltmeter enables it to measure up to 500 kV peak.

Since atomic energy power stations will be used for carrying base loads, steels used in coal-fired stations taking the peaks will be subject to heavier intermittent thermal stresses. Their fatigue strength is therefore being tested from initial stages of creep to final rupture. Laboratory work in the N.P.L. Metallurgy Division has indicated that a ferritic steel containing sufficient chromium to be oxidation-resistant and serviceably creep-resistant at 600 deg C can be produced and (subject to proof on an industrial scale) may replace expensive austenitic steels, which tend to intercrystalline rupture with a low elongation.

The British Coal Utilisation Research Association in collaboration with the Boiler Availability Committee has developed a small pulverised-fuel furnace to provide, for the first time, a prediction of the probable behaviour of individual coals in relation to boiler designs, having regard to deposits (due to chlorine and sulphur) on high-temperature surfaces. Four more cyclone-fired boilers are being built in addition to the experimental unit now installed in a major power station.

Metallurgical Investigations

The British Non-Ferrous Metals Research Association is stated to have devised means for controlling the cracking of copper bars alloyed with 1 per cent of cadmium as used for overhead conductors during the rolling-to-rod process. In addition to the investigations in conjunction with the E.R.A. concerning the self-adjusting argon-arc process (previously mentioned), the British Welding Research Association is carrying out numerous inquiries into such matters as porosity and cracking in aluminium alloy weld metal, pressure welding (at King's College, Newcastle-on-Tyne), welding and zirconium alloys (for the Atomic Energy Authority) and of titanium alloys (for the Ministry of Supply). Carbon-dioxide arc shielding for welding alloyed steel is expected to have an important industrial application.

The report includes eight appendices, one of which gives statistical particulars of maintenance allowances for post-graduate training in research. Another furnishes information on grants made for special researches still in hand.

Coal and the Consumer

THE Industrial Coal Consumers' Council, in its report for the year to 30th June last, again emphasises that despite the introduction of nuclear energy coal will be the main source of the nation's heat and power requirements for as far ahead as it can see.

Referring to the increase in the price of coal from 1st July, the report says that the Council realises that coal prices in this country are still lower than elsewhere in Europe, but consumer members of the Council are naturally fearful of the inflationary effect of the increase. Nevertheless, after hearing the N.C.B.'s explanation of the need for increased revenue despite the greater productivity achieved, the Council came to the conclusion that there was no practicable alternative to the increase.

The report stresses the importance of fuel efficiency, individually and nationally, and expresses the hope that the Chancellor of the Exchequer will implement the Council's earlier recommendation to give a financial incentive to consumers to install approved appliances and to insulate premises. It explains how consumers can obtain technical advice for increasing efficiency.

GENERATION AND DEVELOPMENT

Power Station Smoke

One section of the annual report of Professor A. B. Semple, medical officer of health, Liverpool, deals with the emission of smoke from the chimneys of the Clarence Dock power station. It states that work has been carried out on the determination of the flue-gas acid dewpoint. The measurement of this factor gives some indication of the sulphur trioxide content of the gases, and it is this component which is considered to be partly responsible for the persistence of the chimney plume.

Experiments have shown that it is possible to depress the acid dewpoint of the flue gas from a boiler by introducing zinc-oxide with the fuel, the zinc-oxide neutralising the sulphur trioxide content of the flue gas by combining chemically to form non-corrosive compounds which are carried away in the flue gases. With heavy additive injection the emission of solid particles from the stack would increase considerably, but as the quantity of zinc-oxide more nearly approaches that required to just neutralise the acid constituents, so does the intensity of the plume decrease.

The procedure used is not commercially applicable owing to the high cost of zinc-oxide as an additive and also because of the very considerable difficulty which would be experienced in exactly proportioning the additive to the amount of coal flowing. Too much additive would be just as bad as too little. In the circumstances it is doubtful whether any solid additive would be satisfactory and it is proposed to continue the experiments using ammonia injected into the flue gases.

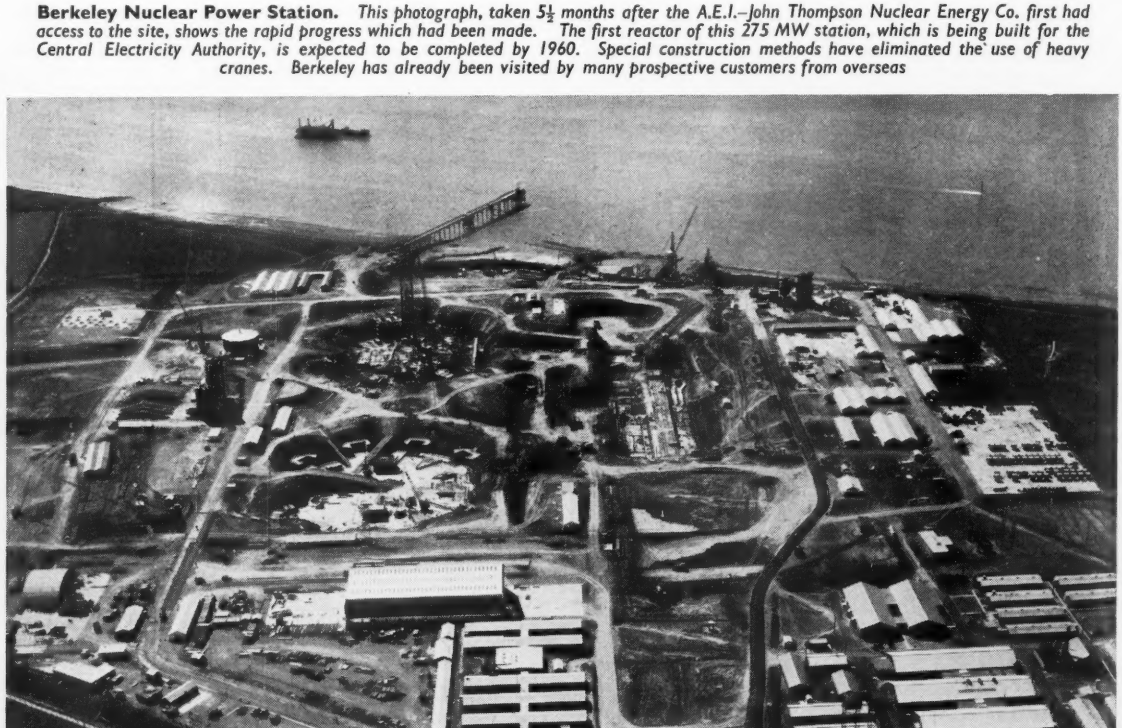
The investigations indicate that there is no easy solution to the smoke emission problem which is, however, a diminishing one as less coal will be burnt in the old boilers as time goes on. Work now proceeding is on the lines of attempting to modify the combustion in the older boilers so as to simulate the conditions found in pulverised fuel units.

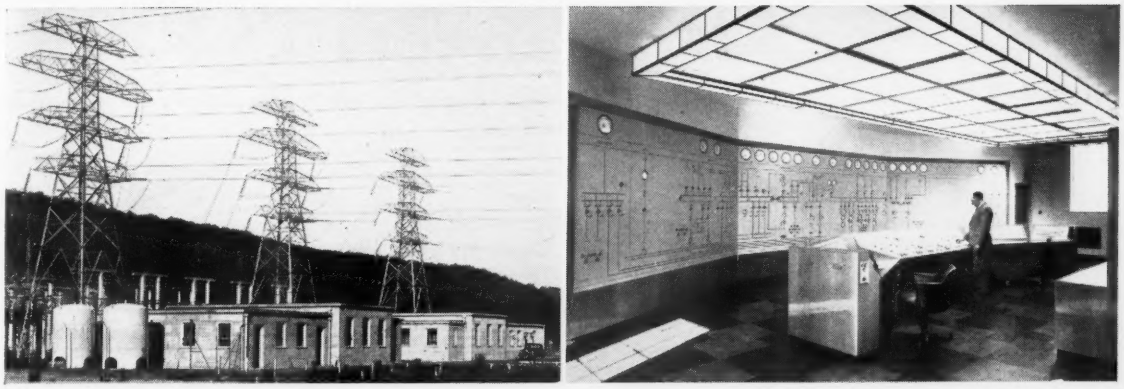
Errochty Group Control Centre

The recent official inauguration of the Errochty power station (*Electrical Review*, 2nd August, page 223) completed the first and largest of the group control centres so far installed in the North of Scotland Hydro-Electric Board's area for the supervision and control of water power stations.

Centralised control enables the maximum use to be made of the rainfall in a particular area. The information transmitted includes knowledge of the loadings of the machines and the water levels at the various reservoirs. In addition to this it is necessary, where dams have been established across a stream or river, to maintain a certain minimum flow down the river for the maintenance of compensation

Berkeley Nuclear Power Station. *This photograph, taken 5½ months after the A.E.I.–John Thompson Nuclear Energy Co. first had access to the site, shows the rapid progress which had been made. The first reactor of this 275 MW station, which is being built for the Central Electricity Authority, is expected to be completed by 1960. Special construction methods have eliminated the use of heavy cranes. Berkeley has already been visited by many prospective customers from overseas*





View of group control centre and switching station at Errochty and (right) diagram panel with network layout and control desk for the generator and hydraulic works control

water or angling needs in the streams. All this information and much more is conveyed over pilot wires and carrier channels (many fitted with Standard Telephones & Cables voice frequency telegraph equipment) to the Errochty group control centre.

The Errochty station (75 MW) is the second largest in installed capacity in the Board's area, the largest being Loch Sloy with a capacity of over 130 MW. These, with the Fasnakyle station in the Glen Affric scheme (66 MW), are all controlled by Standard miniature direct wire control equipment. This gives finger-tip control of the system including the equipment and associated switchgear for synchronising the generators.

Electric Cookers for Durham Council Houses

Durham R.D.C. has received Ministry sanction to borrow £5,000 for installing electric cookers in Council houses. The demand for the cookers is being maintained, and the Council is seeking sanction to borrow another £5,000 to cover the cost of further installations.

Cooker Sales Drive

As a result of a special drive in the Eastern Board's area, 3,894 electric cookers have been sold in one month, the highest total above the set target being achieved by the King's Lynn (Norfolk) District. The campaign was supported by advertising in local newspapers over a period of five weeks, by posters, van display boards, window pelmets, folders, showcards and postal franking and, of course, by determined efforts on the parts of all the district commercial engineers and their staffs. The total result constitutes a record sale for the Board.

The cup which the Board offered for the District achieving the highest percentage of sales above the target figure was presented by the chief commercial officer (Mr. R. H. M. Barkham) to Mr. B. H. Robertson, manager of the King's Lynn District. The District, which includes Swaffham, Hunstanton, Downham and Lynn branches, sold 220 cookers during the month, which was 41 per cent more than was anticipated. The competition will be held annually.

Douglas Engineer's Report

Mr. C. Andrews, borough electrical engineer and manager of Douglas (I.O.M.), points out in his report for 1956-57 that although electricity output continues to rise the undertaking has considerably fewer employees than in 1939. Last year sales in the Douglas area increased by 7·3 per cent to 23·3 million kWh. Reference is made in the report to the introduction by the Corporation, in accordance with a recommendation of the Electricity Commission, of a coal clause which applies to the running charge both of the domestic and power tariffs.

Revenue for the year amounted to £288,979 (against £277,442) and working expenditure totalled £198,100 (£183,582); after meeting loan charges, etc., there was a deficit of £2,740 as compared with a profit of £5,686 in 1955-56. The award in respect of the compensation claim against the Isle of Man Electricity Board, amounting to £63,000 plus interest, was paid on 5th April, 1956, and is included in the accounts.

OVERSEAS

Dominican Republic Electrification Plan

The Chase Manhattan Bank reports that a large-scale electrification plan is under way in the Dominican Republic for completion in 1965. The electrical capacity will be raised from 61,500 kW to 159,000 kW at a cost of $48,000,000. These figures do not include the output of the nuclear energy power station which is to be built at Rio Haina.

Peruvian Hydro-Electric Scheme

The chairman of the Corporacion de Reconstruccion y Fomento del Cuzco, Peru, announced last month that tenders would be invited within 60 days for the building of a hydro-electric power station for the Cuzco area on the Urubamba river. The site now chosen is at Machu-Picchu and the plant, the initial cost of which is estimated at 100 million soles (£2 million), is to have an initial capacity of 20 MW. The ultimate capacity is intended to be 120 MW.

Overloaded Plant in Toronto

The peak load on the Toronto Hydro-Electric System last year was 538,313 kW, an increase of 13,071 kW. During the year 27,400 kW of additional plant capacity was installed, but there remained an overload on the System's facilities of approximately 13,300 kW. Referring to this the Commissioners point out that existing tariffs provide for plant with a necessary measure of spare capacity and thus will obviously yield a surplus if, instead of having spare capacity, the plant is overloaded. This condition, together with a substantial thirteenth credit received from the Provincial Commission on power purchased, accounts for the size of the net income. As capital construction overtakes demand and the spare capacity is re-established, however, this element of surplus will disappear. Last year's surplus of $3·5 million has accordingly been applied for investment in capital assets.

Sales last year rose by 5 per cent to 2,714 million kWh. Despite the increase in the cost of labour and materials which has occurred since the war, the average revenue per kWh received from consumers in 1956 was lower than that in 1937.

The number of consumers supplied with 60 c/s service at the end of 1956 was 75,648 against 36,881 a year before, leaving 123,988 on the 25 c/s system. While only three-eighths of the total number of consumers are yet supplied at 60 c/s, the peak demand of these consumers is 356,100 kW, or approximately two-thirds of the combined load. The rate of conversion has been increased by 50 per cent since 1st January, 1957, so that it is expected that the programme will be completed by the middle of 1959.

DOMESTIC ELECTRICAL EQUIPMENT

Blankets and Pads

THE popularity of the electric blanket is reflected in the number of manufacturers listed in the following survey in which particulars, relating to size, loading, type of material, price, etc., of about forty different makes are given. Actual sales figures are not easily obtainable, but it is estimated that these may well be in excess of the half-million mark.

Providing the simple operating instructions are observed, the electric blanket is completely safe in use, the heating elements being so installed that they cannot come into contact with the user. The elements are, in most cases, encased in plastic or asbestos and the temperature can either be thermostatically controlled or regulated by means of a three-heat switch.

Where no thermostats are employed the self-compensating type of element is generally used, the design of which prevents the heat generated from exceeding a temperature above approximately 140/150 deg F irrespective of how long the blanket is left switched on. Other blankets are so constructed that only half can be switched on at one time if so desired and there are also low-voltage models suitable for operation, through a transformer, at 12 or 24 V.

Other points applicable to certain models are raised figures on the switches so that the blanket can be heat controlled in the dark; temperature regulators to enable one temperature to be maintained over a period; and pilot lights in the form of neon tubes in the switches. Washable covers in a wide range of colours are obtainable and in general it is these alone that should be washed and not the actual blanket. Many more makers have now received the certification mark of approval from the British Standards Institution entitling them to use the "Kite Mark" on their products.

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
H. J. BALDWIN & CO., LTD., 132, Arkwright Street, Nottingham.	"Thermat" Pad	16×12	50 W	Three-heat, thermostatic	Various floral designs	Wool	—	£4 0 0	£0 17 4
	"Thermat" Junior	40×26	50 W	Single-heat, non-thermostatic	White, pink, blue and floral designs	Wool	De-luxe models have quilted floral sateen covers	£4 9 0 £5 12 3 (de-luxe)	£0 19 3 £1 4 4 (de-luxe)
	"Thermat" Medium	60×26	75 W	Single-heat, non-thermostatic	White, pink, blue and floral designs	Wool	De-luxe models have quilted floral sateen covers	£5 18 0 £7 12 0 (de-luxe)	£1 5 7 £1 12 11 (de-luxe)
	"Thermat" Large	60×48	135 W	Single-heat, non-thermostatic	White, pink, blue and floral designs	Wool	De-luxe models have quilted floral sateen covers	£10 16 0 £12 12 8 (de-luxe)	£2 6 9 £2 14 9 (de-luxe)
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	"Best" Blanket	60×30	90 W	Self-compensating element	Apricot	Duplex rayon	One-piece element, d.p. switch	£6 11 0	£1 8 9
	"Best" mattress overlay	66×30	100 W	Self-compensating element	Maroon figured	Cotton damask	One-piece element, d.p. switch	£5 14 6	£1 5 2
BESTFREND ELECTRICAL CO., LTD., Diceland Works, Banstead, Surrey.	"Luxecon" single	60×30	78 W	D/P neon illuminated switch	Various pastel shades	Raised cotton	Fireproof	£3 15 0	£0 16 5
	"Luxecon" double	60×50	130 W	D/P neon illuminated switch	Various pastel shades	Raised cotton	Fireproof	£5 19 6	£1 6 2
BULPITT & SONS, LTD., St. George's Works, 132, Icknield Street, Birmingham, 18.	712	60×30	90 W	Thermal balance	Pink, peach or pastel blue	Wool	Neon light indicating switch	£3 18 9	£0 17 9
	714	60×50	135 W	Thermal balance	Pink, peach or pastel blue	Wool	Neon light indicating switch	£5 17 6	£1 5 9
CHALFONT ELECTRICAL PRODUCTS, LTD., Tyrrell Street, Leicester.	"Junior" single	48×26	60 W	Self-compensating element, single-heat switch	Pink, peach and green	Cotton	Satin ribbon binding	£2 15 6	£0 12 0
	"Junior" double	48×30	90 W	Self-compensating element, single-heat switch	Pink, peach and green	Cotton	Satin ribbon binding	£3 12 0	£0 15 7
	"Warmster" single	60×24	70 W	Self-compensating element, single-heat switch	Pink, peach and green	Cotton/rayon	Very soft, satin ribbon binding	£4 0 0	£0 17 4

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
CHALFONT ELECTRICAL PRODUCTS, LTD., Tyrrell Street, Leicester. (*continued*)	"Warmster" double	60×42	130 W	Self-compensating element, single-heat switch	Pink, peach and green	Cotton/rayon	Very soft, satin ribbon binding	£6 0 0	£1 6 0
	"De-Luxe" single	60×33	140 W	Thermostatic, three-heat switches	Pink, peach, blue and green	Wool	Satin ribbon binding	£8 15 0	£1 18 5
	"De-Luxe" double	60×51	220 W	Thermostatic, three-heat switches	Pink, peach, blue and green	Wool	Dual control, satin ribbon binding	£14 8 8	£3 3 4
	"Bed Sheet" single	60×33	85 W (*a*) and 140 W (*b*)	Thermostatic, single-heat (*a*) and three-heat switch (*b*)	Pink, peach, blue and green	Rayon	—	£6 17 6 (*a*) £7 10 0 (*b*)	£1 10 2 (*a*) £1 12 11 (*b*)
	"Bed Sheet" double	60×51	220 W	Thermostatic, three-heat switch	Pink, peach, blue and green	Rayon	Dual control	£12 16 0	£2 16 2
DENHAMS (NORWICH), LTD., All Saints Road, Acton, W.3.	"Norvic" pad P.1 and P.3	12×16	45 W (*a*) and 70 W (*b*)	Thermostatic, single-heat (*a*) and three-heat (*b*)	White, pink, blue and peach	Cotton base, flannelette (fireproof)	Rayon covers	£2 17 0 (*a*) £3 10 11 (*b*)	£0 12 6 (*a*) £0 15 7 (*b*)
	"Norvic" single S.1 and S.3	30×54	95 W (a) and 110 W (b)	Thermostatic, single-heat (a) and three-heat (b)	White, pink, blue and peach	Cotton base, flannelette (fireproof)	Rayon covers	£6 0 7 (a) £7 2 0 (b)	£1 6 5 (a) £1 11 3 (b)
	"Norvic" double D.R.3	45×60	175 W	Thermostatic, three-heat switch	Pink, green and peach	Cotton base, flannelette (fireproof)	Rayon cover	£11 1 6	£2 8 6
	"Norvic" double dual-control D.N.3	56×72	200 W	Thermostatic, two switches	Pink, peach and blue	Wool	—	£15 10 0	£3 2 0
	"Norvic" single N.3	30×54	110 W	Thermostatic, three-heat	Pink, blue and peach	Cotton base, wool (fireproof)	—	£7 10 6	£1 13 0
	"Norvic" 12 V all-night L.3	30×60	120 W	Three-heat through transformer	Pink, blue and peach	Cotton base (fireproof)	Price includes transformer	£9 12 6	£0 17 6
	"Norvic" 12 V all-night D.L.3	52×60	140 W	Three-heat through transformer	Pink, blue and peach	Cotton base (fireproof)	Price includes transformer	£15 7 0	£1 9 0
	"Norvic" single W.1	30×54	75 W	Single-heat	Pink, blue and peach	Wool	—	£5 4 0	£1 2 0

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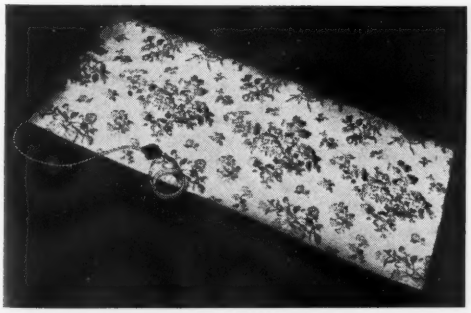

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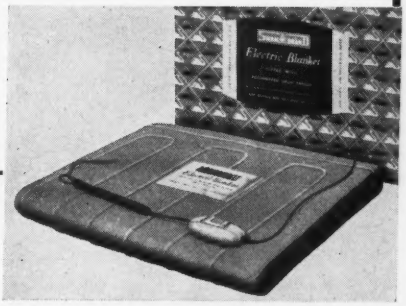

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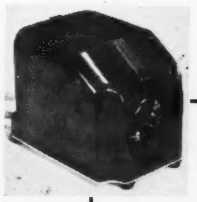
1. *Chalfont blanket*
2. *Best Products' blanket*
3. *H. J. Baldwin & Co.'s "Thermat" blanket*
4. *Bulpitt "Swan Brand" blanket*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
DENHAMS (NORWICH), LTD., All Saints Road, Acton, W.3. *(continued)*	"Norvic" double D.W.1	45×60	130 W	Single-heat	Pink, blue and peach	Wool	—	£8 16 6	£1 18 6
	"Corona" single C.3	30×50	75 W	Three-heat	Pink or blue	Cotton base (fireproof)	Flannelette cover	£4 0 0	£0 17 6
	"Corona" double C.D.3	45×57	130 W	Three-heat	Pink or blue	Cotton base (fireproof)	Flannelette cover	£6 10 10	£1 8 8
EASIPOWER, LTD., 27, Albemarle Street, London, W.1.	"Easipower" de-luxe single	60×30	90 W	Non-thermostatic	Peach	Woollen mixture	Pink rayon cover available 15/- extra	£3 19 4	£0 17 5
	"Easipower" de-luxe double	60×48	130 W	Non-thermostatic	Peach	Woollen mixture	Pink rayon cover available 25/- extra	£5 19 0	£1 6 0
ELECTRIC BED-WARMERS, LTD., Commercial Street, Hebden Bridge, Yorks.	"Bedtime Bliss" Peerless single	30×54	120 W	Three-heat switch	Pink, blue, gold or green	Duplex cloth whipped with wool	"Calomatique" long-life element	£6 19 5	£1 8 7
	"Bedtime Bliss" Peerless double	50×60	200 W	Two three-heat switches	Pink, blue, gold or green	Duplex cloth whipped with wool	"Calomatique" long-life element, dual-control	£13 18 10	£2 17 2
	"Bedtime Bliss" De-luxe single	30×54	120 W	Three-heat switch	Pink, blue, gold, rose or green	Wool mixture, satin bound	"Calomatique" long-life element	£7 9 0	£1 10 6
	"Bedtime Bliss" De-luxe double	50×60	200 W	Two three-heat switches	Pink, blue, gold, rose or green	Wool mixture, satin bound	"Calomatique" long-life element, dual-control	£14 18 10	£3 1 0
	"Calora" pad De-luxe major	13×18	80 W	Three-heat switch	White	Duplex cloth	Guaranteed two years	£3 2 3	£0 12 9
S. I. ENGEL, 23-5, Kensington Park Road, London, W.11.	"L'Exquisite"	12×16	60 W	Three-heat switch	White	Flannelette	Complete with washable cover, two thermostats	£1 19 5	£0 8 1
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Sleepwarm" U.95662	50×30	100 W	Single-heat switch, thermostatic	Gold, pink and blue	Fleecy wool/cotton mixture	Satin edging and bow	£5 10 0	£1 4 2
	"Sleepwarm" U.95726	50×30	100 W	Three-heat switch, thermostatic	Gold, pink and blue	Fleecy wool/cotton mixture	Satin edging and bow	£7 0 0	£1 10 9
	"Sleepwarm" U.95727	54×48	180 W	Single-heat switch, thermostatic	Gold, pink and blue	Fleecy wool/cotton mixture	Satin edging and bow	£9 5 0	£2 0 7
	"Sleepwarm" U.95728	54×48	180 W	Three-heat switch, thermostatic	Gold, pink and blue	Fleecy wool/cotton mixture	Satin edging and bow	£12 5 0	£2 13 9
	"Sleepsafe" U.95748	54×30	68 W	Single heat	Natural	Flameproof cotton duck	Flameproof	£3 5 0	£0 14 3
THOMAS FRENCH & SONS, LTD., Chester Road, Manchester, 15.	"Vesta" pad Model 6	20×12	50 W	S/P switch, thermostatic	Pale blue, pale green, pink and peach	Flannelette	Damp resistant cover, element woven into glass fibre	£2 2 9	£0 9 4
	"Vesta" Model 7	30×24	50 W	D/P switch, thermostatic	Pale blue, pale green, pink and peach	Flannelette	Damp resistant cover, element woven into glass fibre	£3 13 8	£0 16 1
	"Vesta" Model 8	54×30	91 W	Three-heat switch, four thermostats	Pink, blue and green	Flannelette	Element woven into glass fibre	£7 4 6	£1 11 6
	"Vesta" Model 9	60×48	235 W	Multi-position thermoset switch, four thermostats	Pink, blue and green	Flannelette	Element woven into glass fibre	£11 16 6	£2 11 7
	"Vesta" Model 10	54×30	67 W	D/P switch, non-thermostatic	Pink, blue and green	Flannelette	Element woven into glass fibre	£4 11 0	£0 19 11
	"Vesta" Model 11	60×48	142 W	Three-position switch, non-thermostatic	Pink, blue and green	Flannelette	Element woven into glass fibre	£8 4 0	£1 15 9
DAVID GRIFFIN, LTD., Wimborne Road, Poole, Dorset.	"Dee Gee" SB/SU	70×34	105 W	Three-heat switch through transformer	Pink and blue	Wool mixture	Operates at 12 V	£9 9 3	£1 0 9
	"Dee Gee" TSB/DU	70×34 (twin)	2×105 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£17 17 6	£2 1 6
	"Dee Gee" DB/DU	70×54	2×90 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£17 0 4	£1 17 8

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
DAVID GRIFFIN, LTD., Wimborne Road, Poole, Dorset. *(continued)*	"Dee Gee" DB/TSU	70×54	2×90 W	Three-heat switch through transformer, dual control	Pink and blue	Wool mixture	Operates at 12 V	£18 1 4	£1 17 8
	"Riviera" RS.1 and RS.2	70×31	115 W	Three-heat switch	Pink and blue	Wool mixture	RS.1 200/220 V RS.2 230/250 V	£6 9 7	£1 8 5
	"Riviera" RD.1 and RD.2	70×48	190 W	Three-heat switch, dual control	Pink and blue	Wool mixture	RD.1 200/220 V RD.2 230/250 V	£10 6 8	£2 5 4
HALL & VERET, LTD., 434, Rochester Way, Sidcup, Kent.	"Veret" bedwarmer	9×3	6·5 W	Thermostatic	Red and black mottled container	Toughened heavy gauge Bakelite	Suppressed for radio and T.V.	£1 17 6	£0 8 3
HOLT ENGINEERING & MANUFACTURING CO., LTD., Hemco Works, 210, Stockport Road, Manchester, 13.	"Hesco"	17×11	33 W	Single-heat switch	White	Woollen	White linen and/or waterproof cover 5/- extra	£2 0 0	£0 8 9
	"Hesco"	22×14	30 W	Single-heat switch	White	Woollen	White linen and/or waterproof cover 5/- extra	£3 10 0	£0 15 0
	"Hesco"	22×14	60 W	Three-heat switch	White	Woollen	White linen and/or waterproof cover 5/- extra	£3 15 0	£0 16 6
	"Hesco"	47×32	125 W	Single-heat switch	White	Woollen	White linen and/or waterproof cover £1 extra	£5 0 0	£1 1 11
	"Hesco"	47×32	260 W	Three-heat switch	White	Woollen	White linen and/or waterproof cover £1 extra	£6 15 0	£1 9 7
	"Hesco"	60×48	520 W	Three-heat dual switch	White	Woollen	White linen and/or waterproof cover 30/- extra	£12 0 0	£2 12 7
ROBERT HOLT (MIDDLESEX), LTD., Florence Road, Edmonton, N.18.	"Solwarm" No. 1	50×54	120 W	Duplicate thermostats	Cream	Cotton	Washable cover 30/- extra	£5 17 3	£1 6 3
	"Solwarm" No. 2	36×50	90 W	Single-heat and thermostats	Cream	Cotton	Washable cover 21/- extra	£3 12 8 (standard) £4 6 8 (special)	£0 16 4 (standard) £0 19 0 (special)
	"Solwarm" No. 3	25×50	60 W	Single-heat and thermostats	Cream	Cotton	Washable cover 18/- extra	£3 1 10 (standard) £3 15 9 (special)	£0 14 2 (standard) £0 17 0 (special)
	"Solwarm" No. 4	17×50	40 W	Single-heat and thermostats	Cream	Cotton	Washable cover 14/- extra	£2 11 11 (standard) £3 4 0 (special)	£0 11 7 (standard) £0 14 4 (special)



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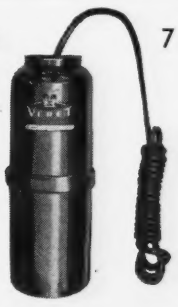

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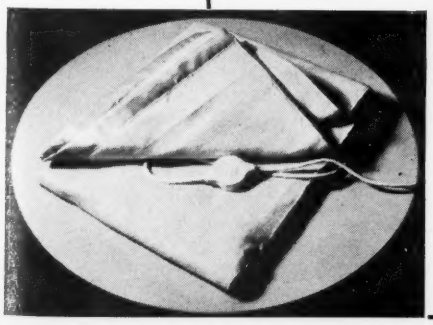

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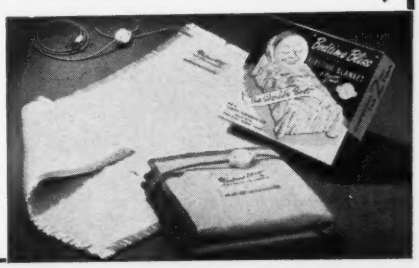

5. *The latest transformer casing designed for the David Griffin "Dee Gee" blanket ("Elo" shock resisting moulded cover manufactured by Birkbys, Ltd.)*
6. *Falks "Sleepwarm"*
7. *Hall & Veret bedwarmer*
8. *French "Vesta" model 8*
9. *Electric Bedwarmers' "Bedtime Bliss" blankets*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
ROBERT HOLT (MIDDLESEX), LTD., Florence Road, Edmonton, N.18. *(continued)*	" Solwarm " No. 5	11×14 16×12	20 W	Thermostatic	Cream	Cotton	Washable cover included. Two-heat	£1 12 4	£0 7 2
	" Solwarm " L.2	50×44	130 W	Thermostatic (optional variable control)	Cream	Cotton	Washable cover 23/6 extra	£4 8 0	£0 19 6
DAVID HOPE & CO., LTD., Nugent Street, Leicester.	" Nelson "	54×33	85 W	Single-heat switch and thermostat	White	Rayon	—	£6 17 6	£1 10 2
	" Nelson "	54×33	140 W	Three-heat switch and thermostat	White	Rayon	—	£7 10 0	£1 12 11
HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2.	Premier " Dreamwell " De-Luxe B.135	50×24	57 W	D/P switch, self-compensating element	Pink	Blanket material edged with satin	Covers 17/6 extra	£4 6 1	£0 18 11
	Premier " Dreamwell " Standard B.105	50×24	57 W	Self-compensating element	Cream	Fleecy material	Covers 17/6 extra	£3 3 6	£0 14 0
	Premier " Warmwell " B.205-8	54×30	80 W	D/P switch, self-compensating element	Pink, green, blue and gold	Blanket material edged with satin	Poplin covers 25/- extra	£6 9 1	£1 8 5
HURSEAL, LTD., 229, Regent Street, London, W.1.	" Hurseal " bed sheet, single	60×33	140 W	Three-heat switch, thermostatic	White, pink or blue	Cotton/rayon mixture	Washable	£7 10	£1 12 11
	" Hurseal " bed sheet, double	60×51	220 W	Three-heat switch, thermostatic	White, pink or blue	Cotton/rayon mixture	Washable, individual control each side	£12 16 0	£2 16 2
ISOPAD, LTD., 3, Rosemont Road London, N.W.3.	" Isoblanket Lana " BS	60×80 (36×54 heated)	100 W	Three-heat switch	Pink, green and blue	Pure wool	Unheated part tucks in	£9 16 0	£2 2 6
	" Isoblanket Lana " BS	70×80 (54×60 heated)	160 W	Three-heat switch for each half	Pink, green and blue	Pure wool	Unheated part tucks in, extra large	£19 4 0	£4 3 2
	" Isoblanket Thea " single	30×56	80 W	Three-heat switch	Pink, green and blue	Raised cotton	Fireproof	£5 10 0	£1 3 10
	" Isoblanket Thea " double	50×60	140 W	Three-heat switch	Pink, green and blue	Raised cotton	Fireproof	£8 10 0	£1 16 10
	" Isoblanket Una "	30×48	60 W	Single-heat switch	Pink, green and blue	Raised cotton	Fireproof	£4 0 0	£0 17 4
F. MARSHALL (TEXTILES), LTD., Hollins Mill, Marsh, Huddersfield.	" Mar-Tex " pad	18×22	64 W	Three-heat D/P rotary switch	Pastel pink	Cotton and rayon, flameproofed	Non-thermostatic, asbestos element	£2 10 6	£0 11 1
	" Mar-Tex " three-heat blanket	34×56	100 W	Three-heat D/P rotary switch	Pastel pink	Cotton and rayon, flameproofed	Universal voltage	£2 9 6	£0 17 5
	" Mar-Tex " single blanket	26×50	74 W	Single-heat switch	Pastel pink	Cotton and rayon, flameproofed	200/220 V and 230/250 V	£2 10 10	£0 11 2
	" Mar-Tex " double blanket	48×50	148 W	Single switch each half	Pastel pink	Cotton and rayon, flameproofed	200/220 V and 230/250 V	£4 13 1	£1 0 5
MILLIWATT, LTD., 44, Princess Road, Regent's Park, London, N.W.1.	" Milliwatt " standard blanket	30×50	140 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£6 10 0	£1 8 2
	" Milliwatt " standard blanket	30×50	100 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£5 0 0	£1 1 8
	" Milliwatt " dual control double blanket	50×60	280 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£16 0 0	£3 9 4
	" Milliwatt " dual control blanket	50×60	200 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£13 0 0	£2 16 4
	" Milliwatt " standard pad	13½×15	80 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 15 0	£0 16 3
	" Milliwatt " standard pad	13½×15	40 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£2 2 0	£0 9 1
	" Milliwatt " double pad	15×26	100 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£4 15 0	£1 0 7
	" Milliwatt " double pad	15×26	50 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 5 0	£0 14 1

10. *Modern Electrical Industries "Warmabed" temperature regulator*
11. *Hurseal electric bedsheet*
12. *Isopad "Lana" blanket*
13. *F. Marshall (Textiles) "Mar-Tex" blanket*
14. *Hotpoint "Premier" "Dreamwell" blankets*
15. *Morphy-Richards "Regent" blanket*

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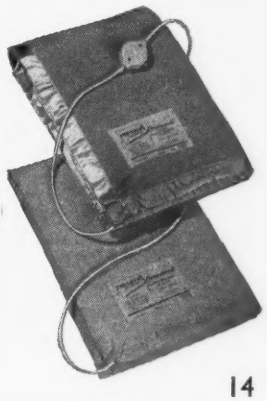

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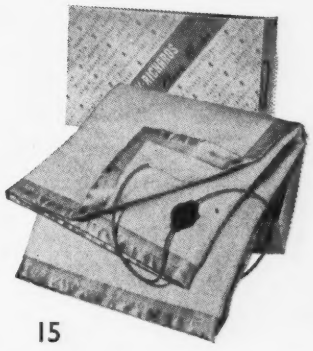

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Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
MILLIWATT, LTD., 44, Princess Road, Regent's Park, London, N.W.1. *(continued)*	"Milliwatt" MW 75	24×50	80 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£3 15 0	£0 16 3
	"Milliwatt" special blanket	25×60	140 W	Three-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£8 0 0	£1 14 8
	"Milliwatt" special blanket	25×60	100 W	Single-heat duplicate thermostats	White, pink, blue, green, cream	Wool felt interior	Washable waterproof cover	£6 10 0	£1 8 2
MODERN ELECTRICAL INDUSTRIES, LTD., Hollingworth Lane, Knottingley, Yorks.	"Warmabed" double	60×42	135 W	Single (*a*) or three-heat (*b*) switches (neon)	Honeysuckle, periwinkle blue, green and pink	All wool	Auto-transformer temperature regulator available	£10 8 0 (*a*) £11 12 0 (*b*)	£2 5 0 (*a*) £2 10 3 (*b*)
	"Warmabed" single	60×28	90 W	Single (*a*) or three-heat (*b*) switches (neon)	Honeysuckle, periwinkle blue, green and pink	All wool	Auto-transformer temperature regulator available	£7 4 0 (*a*) £8 0 0 (*b*)	£1 11 2 (*a*) £1 14 8 (*b*)
	"Warmabed" small single	40×20	41 W	Single-heat switch (neon)	Honeysuckle, periwinkle blue, green and pink	All wool	Auto-transformer temperature regulator available	£4 0 0	£0 17 4
	"Warmabed" "Golden Rest"	50×25	68 W	Single-heat switch (neon)	Honeysuckle	All wool	Auto-transformer temperature regulator available	£4 6 4	£0 18 8
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1.	"Popular" BBU/1 single	48×26	63 W	Single-heat switch	Pink	Cotton	Braided edge	£2 15 6	£0 12 0
	"Popular" BCU/1 double	48×39	100 W	Single-heat switch	Pink	Cotton	Braided edge	£3 12 0	£0 15 7
	"Regent" BS/1 single	60×24	70 W	Single-heat switch	Peach, pink or blue	Wool mixture	Braided edge	£4 0 0	£0 17 4
	"Regent" BD/1 double	60×42½	130 W	Single-heat switch	Peach, pink or blue	Wool mixture	Braided edge	£6 0 0	£1 6 0

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
MORPHY-RICHARDS, LTD., 6, Conduit Street, London, W.1. *(continued)*	"Imperial" BEU/1 single	60×24	70 W	Three-heat switch	Peach, pink or blue	Wool mixture	Braided edge	£4 15 0	£1 0 7
	"Imperial" BFU/1 double	60×42½	130 W	Three-heat switch	Peach, pink or blue	Wool mixture	Braided edge	£7 0 0	£1 10 4
MOSSLEY BLANKET & CARPET CO., LTD., Bank and Union Mills, Mossley, nr. Manchester.	"Kosywol" De-Luxe single	54×27	75 W	Neon D/P safety switch	Rose, blue, green or white	Fibro blend, wool content	Waterproof element	£2 16 4	£0 12 2
	"Kosywol" De-Luxe double	54×54	150 W	Neon D/P safety switch	Rose, blue, green or white	Fibro blend, wool content	Waterproof element	£4 18 2	£1 1 4
	"Kosywol" "X" Lente	36×24	46 W	S/P on/off switch	Rose, blue, green or white	Fibro blend wool content	Waterproof element	£2 5 0	£0 9 9
	"Kosywol" "Little Wonder"	26×24	36 W	S/P on/off switch	Rose, blue, green or white	Fibro blend, wool content	Waterproof element	£1 17 5	£0 8 1
NORRAND, LTD., Clayton Lane, Bradford, 5, Yorkshire.	"Westminster"	54×27	67 W	Switched, thermal balance	Pink, iade or gold	Fleecy cotton, bias bound	Three-year guarantee, washable cover 14/11	£2 16 8	£0 12 3
PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2.	EA.1213 single	60×28	75 W	Three-heat switch	Peach	Pure wool	Natural heat dissipation	£6 0 6	£1 6 6
	EA.1223 double	60×48	130 W	Three-heat switch	Peach	Pure wool	Natural heat dissipation	£9 9 5	£2 1 7
PIFCO, LTD., Watling Street, Manchester, 4.	"Favourite" 1267 single	48×26	58 W	Self-compensating element	Gold, pink and eau-de-nil	Heavy cotton twill	Satin ribbon binding	£2 15 4½	£0 12 1½
	"Favourite" 1268 double	48×39	93 W	Self-compensating element	Gold, pink and eau-de-nil	Heavy cotton twill	Satin ribbon binding	£3 11 9	£0 15 9
	"Popular" 1167 single	60×24	66 W	Self-compensating element	Gold, pink and eau-de-nil	Wool and cotton mixture	Satin ribbon binding	£4 0 0	£0 17 6

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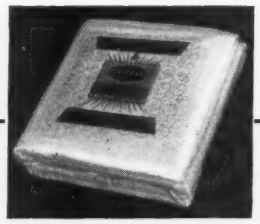

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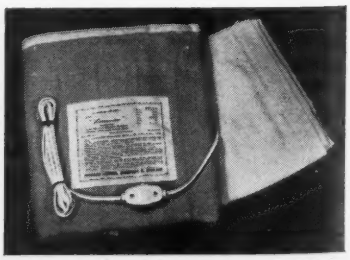

16. *"Sleep Content" single-bed size blanket*
17. *Stanley Bros. "Cumfee" blanket*
18. *Thermalux Electrical Products mattress overlay*
19. *Pifco "Popular" blanket*
20. *Philips Model EA.1213 blanket*
21. *Norrand "Westminster" blanket and cover*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
PIFCO, LTD., Watling Street, Manchester, 4. (*continued*)	"Popular" 1168 double	60×42½	125 W	Self-compensating element	Gold, pink and eau-de-nil	Wool and cotton mixture	Satin ribbon binding	£6 0 0	£1 6 4
	"De-Luxe" 2263 single	62×28	120 W	Thermostatic	Gold, peach, powder blue	Pure wool	Satin ribbon binding	£7 3 11	£1 11 7
	"De-Luxe" 2264 double	62×42½	186 W	Thermostatic	Gold, peach, powder blue	Pure wool	Satin ribbon binding	£10 7 11	£2 5 7
"SLEEP CONTENT" APPLIANCES, Radiant Works, 9, South Parade, Huddersfield.	"Sleep Content"	50×26	75 W	Self-compensating element	White	Cotton and wool mixture		£2 9 0	£0 10 9
	"Sleep Content"	52×38	75 W	Self-compensating element	White	Cotton and wool mixture		£3 12 8	£0 15 11
STANLEY BROS. ALDERSHOT, LTD., Pool Road, Aldershot.	"Cozy"	60×27	110 W (*a*) and 150 W (*b*)	Thermostatic, single (*a*) and three-heat (*b*)	White	Cotton	Cover available 20/- extra	£5 0 0 (*a*) £6 8 0 (*b*)	£1 1 8 (*a*) £1 7 9 (*b*)
	"Cozy"	50×54	190 W	Three-heat thermostatic	White	Cotton	Cover available 32/- extra	£10 0 0	£2 3 4
	"Cozy"	16×12	35 W	Single-heat	White	Cotton	Detachable cover included	£1 16 0	£0 7 10
	"Cozy"	16×22	50 W	Single-heat	White	Cotton	Detachable cover included	£2 10 0	£0 10 10
	"Cozy"	16×24	75 W	Three-heat	White	Cotton	Detachable cover included	£3 12 0	£0 15 7
	"Cumfee"	50×25	65 W	Self-compensating element	White	Cotton	Cover available 15/- extra	£2 9 0	£0 10 7
	"Cumfee"	60×27	90 W	Self-compensating element	White	Cotton	Cover available 20/- extra	£3 3 0	£0 13 8
	"Cumfee"	50×40	110 W	Self-compensating element	White	Cotton	Cover available 28/- extra	£3 10 0	£0 15 2
SUTCLIFFE & CLARKSON, LTD., Spa Street Works, Burnley, Lancs.	"Little Gem"	53×25	60 W	—	Pink	Cotton blanket material	—	£2 8 10	£0 10 8
	LS.1	53×25	60 W	—	White	Raised cotton	Proban treated material	£2 19 4	£0 13 0
	LD.1	53×40	95 W	Illuminated on/off switch	White	Raised cotton	Proban treated material	£4 4 3	£0 18 6
	LD.3	53×40	95 W	Three-heat switch	White	Raised cotton	Proban treated material	£4 8 9	£0 19 6
	VR.1	53×25	60 W	Illuminated on/off switch	Blue	Wool mixture	Elements enclosed in Proban treated material	£4 4 5	£0 18 6
	VR.2	53×40	95 W	Illuminated on/off switch	Blue	Wool mixture	Elements enclosed in Proban treated material	£5 10 10	£1 4 4
	VR.3	53×40	95 W	Three-heat switch	Blue	Wool mixture	Elements enclosed in Proban treated material	£5 14 2	£1 5 0
	HS.3	57×26	90 W	Three-heat switch	Pink	Wool mixture	—	£5 0 6	£1 2 0
	HD.3	57×40	140 W	Three-heat	Pink	Wool mixture	—	£5 19 6	£1 6 3
TELSEN ELECTRIC CO. (1935), LTD., 9, Fitzgeorge Street, Collyhurst, Manchester, 9.	"Telsen"	60×30 (single) 60×90 (double)	100 W	Thermostatic. Double size has the twin control feature	Green, blue, pink and peach	Witney blanket finish	Washable, rapid heating	£6 17 6 (single) £11 17 6 (double)	£3 2 3 (single) £5 6 3 (double)
THERMALUX ELECTRICAL PRODUCTS, LTD., Talbot Works, Halifax.	"Thermalux" mattress overlay Model M	27×48	85 W	Thermostatic	Pink, green or blue	Woollen felt, cotton ticking covering	Hand switch 14/2 extra. Washable cover £1 extra	£5 4 0	£1 2 6
	"Thermalux" mattress overlay Model J	27×72	125 W	Thermostatic	Pink, green or blue	Woollen felt, cotton ticking covering	Hand switch 14/2 extra. Washable cover 26/- extra	£7 8 0	£1 12 0

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
THERMALUX ELECTRICAL PRODUCTS, LTD., Talbot Works, Halifax. *(continued)*	"Thermalux" mattress overlay Model OSB	36×72	180 W	Thermostatic	Pink, green or blue	Woollen felt, cotton ticking covering	Hand switch 14/2 extra. Washable cover 35/- extra	£10 0 0	£2 3 4
	"Thermalux" mattress overlay Model DB	54×72	250 W	Thermostatic	Pink, green or blue	Woollen felt, cotton ticking covering	Hand switch 14/2 extra. Washable cover 45/- extra	£13 4 0	£2 17 2
	"Thermalux" mattress overlay Model DB2	54×72	250 W	Two switches control each half separately	Pink, green or blue	Woollen felt, cotton ticking covering	Washable cover 45/- extra	£15 4 0	£3 5 10
THERMEGA, LTD., 51-53, Victoria Street, London, S.W.1.	"Thermega" pad P.1612/3	16×12	90 W	Three-heat thermostatic	White	Wool/felt cotton	Complete with coloured covers	£3 5 8	£0 14 3
	"Thermega" pad P.2416/3	24×16	110 W	Three-heat thermostatic	White	Wool/felt cotton	Complete with coloured covers	£5 10 0	£1 3 10
	"Thermega" domestic blanket single T.5430	54×30	110 W	Single-heat thermostatic	White, blue binding	Pure wool moth proofed	Covers 27/- extra	£8 5 0	£1 15 9
	"Thermega" domestic blanket double T.6048	60×48	200 W	Single-heat thermostatic	White, blue binding	Pure wool moth proofed	Covers 48/- extra	£13 0 0	£2 16 4
	"Thermega" bedwarmer single W.5430	54×30	80 W	Single-heat non-thermostatic	White	Pure wool moth proofed	Covers 27/- extra	£6 6 0	£1 7 4
	"Thermega" bedwarmer double W.6048	60×48	140 W	Single-heat non-thermostatic	White	Pure wool moth proofed	Covers 48/- extra	£10 10 0	£2 5 6
	"Thermega" "Crescent" single U.5025	50×25	62 W	Single-heat non-thermostatic	Peach	Raised cotton	—	£3 16 0	£0 16 6
THERMOLECTRICS, LTD., Chapel Works, Church Street, Hampton-on-Thames.	"Siesta" SBA single	60×30	78 W	Self-compensating element	Rose, pastel pink	Mixture	Neon illuminated indicator switch	£3 2 0	£0 13 7
	"Siesta" DBA double	60×50	123 W	Self-compensating element	Rose, pastel pink	Mixture	Neon illuminated indicator switch	£5 0 0	£1 1 11
THERMOSET APPLIANCES, LTD., Failsworth, Manchester.	"New Era" (standard)	50×30	105 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Price includes cover	£7 0 0	£1 10 8
	"New Era" (twin)	60×48	200 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Price includes cover	£14 5 0	£3 2 6
	"New Era" (single)	60×24	105 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Price includes cover	£7 0 0	£1 10 8
	"Regent"	40×28	80 W	Single-heat. Variable heat control unit 39/6 extra	Pale green and cream	"Duplex" material (cotton)	Price includes cover	£5 15 0	£1 5 3
	"Cozee"	60×28	75 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	"Duplex" material (cotton)	Cover 18/- extra	£3 15 0	£0 16 5
	"Everest"	54×28	60 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	Cotton	Cover 18/- extra	£2 18 0	£0 12 9
	"Everest"	54×50	120 W	Single-heat. Variable heat control unit 39/6 extra	Pale green	Cotton	Cover 22/- extra	£4 16 0	£1 1 0
	"Super"	60×30	75 W	Single-heat. Variable heat control unit 39/6 extra	Biscuit	Pure wool	Cover 18/- extra	£5 10 0	£1 4 1
	"Favourite" pad	18×14	55 W	Single-heat	Pale green and cream	"Duplex" material (cotton)	Price includes cover	£2 15 0	£0 12 1
WARMEX, LTD., 375, Milton Road, Cambridge.	"Warmex" Standard single	50×24	80 W	Self-compensating element, single-heat	Cream	Cotton	Illuminated safety switch	£2 14 0	£0 11 0
	"Warmex" Standard large	50×30	100 W	Self-compensating element, three-heat	Cream	Cotton	Illuminated safety switch	£5 8 0	£1 2 0

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
WARMEX, LTD., 375, Milton Road, Cambridge. *(continued)*	"Warmex" Standard double	50×48	160 W	Self-compensating element, single (*a*) and three-heat (*b*)	Cream	Cotton	Illuminated safety switch	£5 15 4 (*a*) £8 5 6 (*b*)	£1 2 8 (*a*) £1 13 6 (*b*)
	"Warmex" De-Luxe single	50×24	80 W	Thermostatic, single-heat	Cream	Cotton	Illuminated safety switch	£3 8 8	£0 14 4
	"Warmex" De-Luxe large	50×30	100 W	Thermostatic, three-heat	Cream	Cotton	Illuminated safety switch	£6 11 3	£1 3 9
	"Warmex" De-Luxe double	50×48	160 W	Thermostatic, single (*a*) and three-heat (*b*)	Cream	Cotton	Illuminated safety switch	£6 17 4 (*a*) £8 19 1 (*b*)	£1 8 8 (*a*) £1 15 11 (*b*)
WARMGLOW CO. LTD., Progress Road, Leigh-on-Sea, Essex.	"Juno"	50×28	50 W	Natural heat dissipation	Peach or blue with matching binding	Flame-proofed fleecy cotton	Completely sealed elements	£2 13 4½	£0 11 8½
	"Stella"	60×31	72 W	Natural heat dissipation	Peach or blue with matching binding	Flame-proofed fleecy cotton	Completely sealed elements	£3 7 4½	£0 14 9½
	"Diana"	60×49	116 W	Natural heat dissipation	Peach or blue with matching binding	Flame-proofed fleecy cotton	Completely sealed elements	£5 1 3	£1 2 2
	"De-Luxe" B	54×36	63 W	Natural heat dissipation	Rose, blue, camel and green	Real wool or flame-proofed wool mixture	Washable, having completely sealed elements. Calico covers available	£6 19 6	£1 10 6
	"De-Luxe" C	72×54	108 W	Natural heat dissipation	Rose, blue, camel and green	Real wool or flame-proofed wool mixture	Washable, having completely sealed elements. Calico covers available	£12 0 11	£2 12 9

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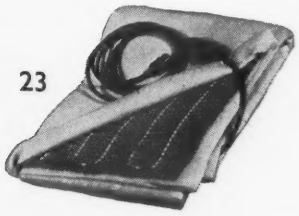

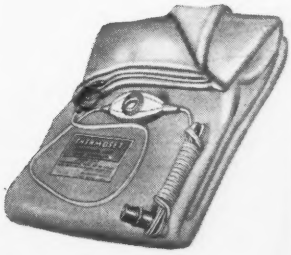

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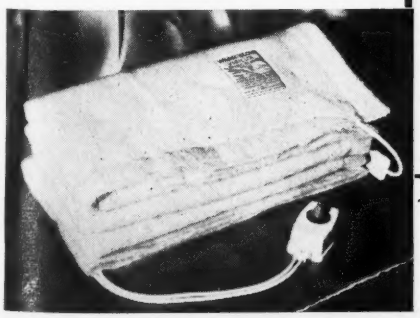

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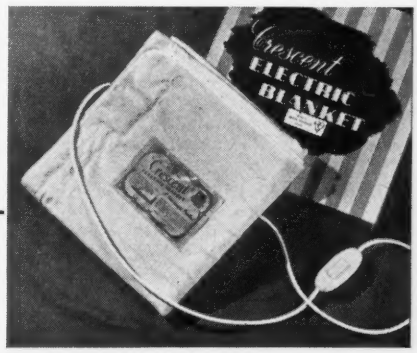


22. *Windak safety blanket with transformer*

23. *Wye Valley Hand Weavers blanket*

24. *Warm-Glow "Vigilux" blanket*

25. *Thermoset Appliances "New Era" blanket with infinitely variable heat control unit*

26. *Thermega "Crescent" blanket*

Manufacturer	Name or Model	Size (inches)	Maximum Loading	Method of Heat Control	Colour	Material	Special Features	Price (excl. tax)	Purchase Tax
WARMGLOW CO., LTD., Progress Road, Leigh-on-Sea, Essex. *(continued)*	"Vigilux" SV	65×36	78 W	Variable temperature control box	Rose, blue, camel and green	Real wool or flame-proofed wool mixture	Washable, having completely sealed elements. Calico covers available	£9 8 9	£2 1 4
	"Vigilux" DV	72×58	140 W	Variable temperature control box	Rose, blue, camel and green	Real wool or flame-proofed wool mixture	Washable, having completely sealed elements. Calico covers available	£14 1 1	£3 1 7
	"Vigilux" TV	72×58	2×70 W	Two variable temperature control boxes	Rose, blue, camel and green	Real wool or flame-proofed wool mixture	Washable, having completely sealed elements. Calico covers available	£16 1 3	£3 10 4
WARRANTY ELECTRICAL PRODUCTS CO., 210, West End Lane, London, N.W.6.	DBSA (Standard) and DBSA4 (De-Luxe)	60×50	300 W	Thermostatic and two infinitely variable switches	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switches, washable cover	£18 0 0 (DBSA) £20 5 0 (DBSA4)	£4 1 0 (DBSA) £4 11 0 (DBSA4)
	DBA (Standard) and DBA4 (De-Luxe)	50×50	250 W	Thermostatic and two infinitely variable switches	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switches, washable cover	£15 0 0 (DBA) £17 5 0 (DBA4)	£3 7 6 (DBA) £3 17 8 (DBA4)
	SA (Standard) and SA4 (De-Luxe)	60×24	150 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switch, washable cover	£7 19 2 (SA) £9 1 8 (SA4)	£1 15 6 (SA) £2 1 0 (SA4)
	A (Standard) and A4 (De-Luxe)	48×24	125 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switch, washable cover	£6 10 7 (A) £7 13 1 (A4)	£1 9 3 (A) £1 14 2 (A4)
	B	24×24	75 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switch, washable cover	£4 17 9	£1 2 0
	C	12×24	60 W	Thermostatic and infinitely variable switch	Cream, pink, sky blue, camel, green	Flannelette	"Magic Brain" switch, washable cover	£3 7 2	£0 15 0
	DBSA3	60×50	300 W	Thermostatic and two three-heat switches	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£16 0 0	£3 14 6
	DBA3	50×50	250 W	Thermostatic and two three-heat switches	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£14 0 0	£3 4 0
	SA3	60×24	150 W	Thermostatic and three-heat switch	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£7 2 9	£1 12 6
	A3	48×24	125 W	Thermostatic and three-heat switch	Cream, pink, sky blue, camel, green	Flannelette	Washable cover	£5 13 2	£1 6 3
WINDAK, LTD., Woodside, Poynton, Cheshire.	"Windak" single	70×33	200 W	Step-down transformer 240–24–18–12 V	Pink/gold check	Cotton	Low-voltage. Price includes transformer	£13 13 5	£1 9 1
	"Windak" double	70×52	200 W	Step-down transformer 240–24–18–12 V	Pink/gold check	Cotton	Low-voltage. Price includes transformer	£15 17 11	£1 19 1
	"Windak" twin	Two 70×33	200 W	Step-down transformer 240–24–18–12 V	Pink/gold check	Cotton	Low-voltage. Price includes transformer	£19 12 2	£2 15 10
WYE VALLEY HAND WEAVERS, Ross-on-Wye, Herefordshire.	"Wye Valley"	54×31	70 W	Single-heat switch	Cream (*a*), blue, green or gold (*b*)	Flannelette cover	Hand woven element. Covers extra, white 20/- striped 25/-	£4 3 2 (*a*) £4 11 10 (*b*)	£0 18 9 (*a*) £1 0 8 (*b*)
	"Wye Valley"	54×60	142 W	Single-heat switch	Cream (*a*), blue, green or gold (*b*)	Flannelette cover	Hand woven element. Cover extra, white 40/-	£8 6 4 (*a*) £9 3 8 (*b*)	£1 17 6 (*a*) £2 1 4 (*b*)
	"Wye Valley"	50×38	79 W	Single-heat switch	Cream (*a*), blue, green or gold (*b*)	Flannelette cover	Hand woven element	£4 17 8 (*a*) £5 6 8 (*b*)	£1 2 0 (*a*) £1 4 0 (*b*)
	"Wye Valley" De-Luxe	49×38	79 W	Single-heat switch	Peach	Vynide cover	Cover can be sponged down	£5 14 0	£1 5 8

NEW ELECTRICAL EQUIPMENT

Polyphase Meters

Two-element type NF3 and three-element type NF4 polyphase watthour and maximum demand meters in light-weight front-connected cases now being produced by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, comply fully with B.S. 37 (Part 4) 1954 and B.S. 37 (Part 5) 1955 and have been approved by the Ministry of Power.

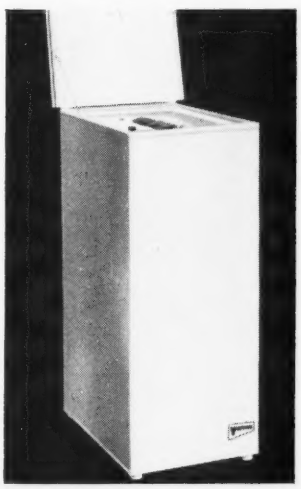
The electro-magnet element is similar to that employed in the types NF and NF5 single-phase meters. The assembly of the elements on a common die-cast frame forms a rigid structure with fixed magnetic paths and constant air-gaps, ensuring permanently accurate performance. The brake magnet assembly is two U-shaped Alcomax magnets which, with the temperature compensators for non-inductive loads, are enclosed in a single die-casting. The friction-less worm drive to the six-pointer registering mechanism is cut on the rotor shaft.

The meters are fully compensated for ambient temperature variations on both non-inductive and inductive loads. Compensation ensures a straight-line characteristic up to 25 per cent overload and simple means are provided for making calibration adjustments.

Clothes Dryer

Following upon the success of the "Victor Major" clothes dryer during the past year the VICTOR MANUFACTURING CO. (GREENGATES), LTD., now announce the production of another model, the "Victor Minor," designed for domestic use. It is 36in high by 15½in wide by 21in deep and the interior is fitted with five removable black plastic rods for clothes hanging purposes. The heating is by means of a 1 kW black-heat element. A hinged working top lid is provided and the whole is finished in cream or white stoved enamel. The price is £12 8s plus £5 11s 7d purchase tax in the United Kingdom.

"Victor Minor" clothes dryer



20 A Switches

A new range of 20 A surface switches, suitable for the control of water heaters as well as for many other purposes, has been introduced by M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18. The switches are made in all-insulated and metalclad patterns, with or without neon indicator lamps.

The new M.K. Electric range of 20 A switches

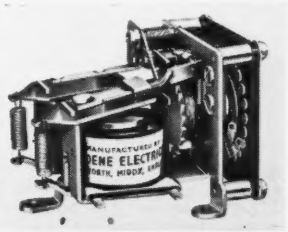
For ease of installation the terminals are placed for through wiring, and good earthing facilities are provided. The all-insulated units are supplied with their own self-contained mounting blocks. There is an incombustible compartment to house the cables.

The prices, without pilot light, are:—All insulated, 6s 8d (brown) and 7s 8d (ivory), and metalclad, 9s. With pilot light, all-insulated, 11s 8d (brown) and 12s 8d (ivory), and metalclad, 14s. Any of the switches can be supplied marked "Water Heater," if required, at a cost for marking of 4d per switch.

Stepping Relay

A stepping relay with zero reset which is one of the "Rodene" range is now available from D. ROBINSON & Co., 58, Oaks Avenue, Worcester Park, Surrey. It is intended for use as a selector, counting or memory relay in such applications as the automatic control of apparatus and production processes; this unit has a rotary switch with heavy stud type fine silver stationary contacts and silver-graphite moving contacts.

It can be either 21-way single-pole, or 10-way double-pole, and is stepped forward one position every time a pulse is fed to the coil shown in the front of the photograph. A momentary impulse to a second coil lifts a pawl and allows a spring to reset the switch to the zero position. This is assured by a latch which holds the pawl out until the next forward pulse. The relay can also be supplied without the switch-back for use as a "pecker motor" or "rotary solenoid." Important features are that the unit can be operated direct from a.c., and that the rating is only 45 VA on a.c., or 15 W on d.c. The size is 3in by 3in by 2½in, the maximum speed is 40 steps per second, and the price with standard coils is £3 18s.



"Rodene" stepping relay with zero reset

Lincass electric kettle

Electric Kettles

A new range of electric kettles, fitted with either 1,000 or 1,500 W automatic ejector type elements, is now available from LINCASS ELECTRIC, LTD., White Hart Yard, Guildford Street, Chertsey, Surrey. The new design incorporates a continuous aluminium handle fitted with an attractive finger-grooved handle grip. The body of the kettle is in polished aluminium or a high gloss range of "House and Garden" colours including guardsman red, leaf green or cornflower blue. The prices range from £2 8s 6d to £3 4s 6d plus 10s 7d and 14s 1d, respectively, for purchase tax in the United Kingdom.

Financial Section

STOCKS and SHARES

FEW signs remain now of the big switching movement from gilt-edged stocks to ordinary shares which was the main feature of the Stock Exchange scene during the first half of this year. It cannot yet be said that the process has been put into reverse on any large scale, but the graphs are already showing an appreciable convergence between the lines representing average prices in the gilt-edged and industrial markets. A persistence of moderate buying has kept Government securities moving gradually upwards, with medium-dated and low-priced issues such as the 3 per cent British Electricity stocks principally in favour because of the certain capital profits of some 25 to 30 points assured by the time they are paid off at par. Industrials continued to be restrained by constant reminders, in one company report after another, of the manner in which wage increases are contracting profit margins. Excellent results published by Thorn Electrical Industries came as a relief after a succession of rather dispiriting company reports in the electrical market.

Thorn Electrical Results

Increases announced by Thorn Electrical Industries in both the earnings and the dividend for the year ended last March were above market expectations. Subsequently the price of the 5s shares was raised to 25s. The full annual report has to be awaited for an indication as to whether the lighting or the radio and television divisions of the business made the larger contribution to the 22 per cent improvement in the trading profit, which now tops the £2 million mark. Much heavier charges for depreciation and taxation reduce the net figure to £635,000 (against £572,000 previously), but this provides very comfortably for the improvement in the single ordinary dividend payment from 15 to 17½ per cent. The conservatism of the financial policy, coupled with the growth potentialities of the business, would account largely for the quotation of the shares on a 3½ per cent yield basis.

Price Changes

In the fortnight covered by the accompanying price lists there was a predominance of moderate falls in electrical share quotations. Most of the leaders in this market receded by amounts varying from 1s 3d in the case of A.E.I. and English Electric, to 2s 6d and 2s in Parsons and Reyrolle respectively. Simon-Carves lost another 3s following a decline of 2s in the previous week, while International Combustion, Head Wrightson and Clarke Chapman also lost ground. B.I.C.C. were quoted 2s lower, and other cable shares were unsettled by the depression in copper prices. Good exceptions to the trend were provided by Duport, which put on 2s to 21s, their best price of the year, and Ward & Goldstone (2s 6d up at 57s 6d x.d.) on further consideration of the annual report. H. J. Baldwin, A. F. Bulgin and Cossor also improved, and Tube Investments staged a strong recovery from an initial decline. New shares issued by British Aluminium

Price Changes in

Company or Board	Nom. Value	Middle price 12th Aug.	Two Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	74⅛	+2	3	3	4 0 6	80	71½
Brit. Elec. 1974/77	100	70½xd	+1	3	3	4 5 0	78½	69½
Brit. Elec. 1976/79	100	74½	+1	3½	3½	4 14 0	81½	73½
Brit. Elec. 1974/79	100	85½		4¼	4¼	4 19 6	92½	83½
Overseas Electric Supply								
Calcutta Elec.	£1	16/3		6†	6†	7 7 9†	19/-	15/-
East African Power	£1	20/6	+6d	7	7	6 16 6	21/-	19/-
Nigerian Elec.	£1	17/6		10	10	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	17/6		10	10*	11 8 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6		17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	6/6		45	48	7 7 6	6/6	4/9
Allen, W. H.	£1	47/-		10	10	4 5 0	47/3	33/6
Anglo-Portuguese Tel.	£1	24/3	−6d	8	8	6 12 0	27/6	20/6
Aron Elec. Ord.	£1	58/9		15	15	5 2 3	60/-	53/6
Assd. Automation	10/-	24/-	+3d	5	7½	3 2 6	24/9	17/9
Assoc. Elec. Ord.	£1	60/-	−1/3	15	15	5 0 0	73/-	60/-
Automatic Tel. & El.	£1	73/9	−1/3	15	17	4 12 3	75/-	54/6
Babcock & Wilcox	£1	73/9	−6d	15	15	4 1 3	82/6	70/-
Bakelite	10/-	23/6	−3d	16	15	6 7 9	24/6	20/9
Baldwin, H. J.	2/-	4/9	+9d	20	20	8 8 6	5/-	3/10½
Berry's Electric	5/-	6/6	+6d	—	10	7 13 9	6/6	5/6
British Aluminium	£1	59/6xr		12	12	4 0 6	71/3	59/6
Brit. Elec. Traction: Def. Ord. "A"	5/-	25/-	+6d	22½	25	5 0 0	25/-	17/-
B.I. Callender's	£1	49/3	−2/-	12½	12½	5 1 6	55/-	48/3
B.I. Callender's 6% Pref.	£1	20/6	+6d	6	6	5 17 0	21/9	19/6
British Tabulating	£1	54/6	−6d	9	9	3 6 0	56/3	42/-
British Thermostat	5/-	25/-		25	25	5 0 0	27/6	25/-
British Vac. Cleaner	5/-	6/-		15	10	8 6 9	8/-	6/-
Brook Motors	10/-	37/6		25	25	6 13 3	37/6	30/-
Brush Group	5/-	7/9		10	Nil	—	8/-	4/6
Bulgin, A. F.	1/-	4/9	+3d	50	40*	8 8 6	5/6	4/6
Burco Dean	5/-	13/6	−3d	22½	20	7 8 3	14/-	8/9
Cable & Wireless: Ord.	5/-	12/6xd	+3d	10	10	4 0 0	12/6	9/6
4% Loan	100	90½		4	4	4 8 6	92½	89
Chloride El. Storage "A"	£1	67/-	+9d	17½	17½	5 4 6	68/9	58/-
Clarke Chapman	£1	170/-	+2/6	22½	27½	3 4 9	9	6½
Cole, E. K.	5/-	21/-		17½	17½	4 3 3	23/6	16/6
Cossor, A. C.	5/-	7/-	+9d	15	Nil	Nil	7/3	5/9
Crabtree	10/-	25/-	½−6d	20	20	8 0 0	26/-	23/3
Crompton Parkinson Ord.	5/-	16/6	−1/-	16	16	4 17 0	17/9	14/6
De La Rue	5/-	24/9	+1/9	30	35	7 1 6	24/9	16/3
Decca "A"	4/-	29/6		43¾	43¾	5 18 9	32/3	26/10½
Desoutter	5/-	35/6		30	32½	4 11 6	35/6	27/6
Dewhurst	2/-	7/6		30	16½*	4 6 9	7/6	5/9
Dictograph Tel.	2/-	5/9		20	20	—	6/3	5/9
Dubilier Condenser	1/-	6/6xd		30	30	4 12 3	7/6	5/6
Duport	5/-	21/-	+2/-	23	25	5 19 0	21/-	17/6
E.M.I.	10/-	34/6		15	15	4 7 0	34/9	23/9
Electrical Components	5/-	8/-		25	12½*	7 16 3	8/-	6/6
Elec. Construction	£1	25/-	−1/3	8½	8½	6 16 0	27/6	21/9
Elliott Bros.	5/-	31/-	+6d	17½	20	3 4 6	33/6	26/3
Enfield Cable Ord.	£1	15/6	−1/-	Nil	Nil	Nil	21/6	13/-
English Electric	£1	61/3	−1/3	12½	14	4 11 6	65/-	47/6
English Electric 3¾% Pref.	£1	12/-		3¾	3¾	6 5 0	14/3	13/-
Ericsson Tel.	5/-	48/6	−1/6	20†	22†	2 5 6†	50/-	33/3
Ever Ready	5/-	18/6		35	37½	5 1 3*	20/-	15/-
Falk Stadelmann	£1	37/6		17½	17½	9 6 9	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

changed hands at a premium of about 2s 3d on the price of 58s at which they are offered to shareholders.

Oldham & Son Report

In his review accompanying the annual accounts, the chairman of Oldham & Son says that the improvement in trading profits from under £400,000 to over £450,000 was achieved despite difficulties raised by the Suez Canal stoppage, petrol rationing and the engineering dispute. Sales of car batteries, being mainly for replacement purposes, were affected to an extent smaller than might have been anticipated, and fluctuations in this section of the business were offset by better business in others. The report contains evidence of expanding activity both in home and overseas markets. With the dividend maintained at the rate of 17½ per cent to which it was raised a year ago, the yield on the 1s shares at 2s 9d is a fraction under 6½ per cent. The net surplus for the year covers the amount of the dividend between three and four times over.

Electrical Investments

Company or Board	Nom. Value	Middle price 12th Aug.	Two Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Electrical Shares —continued						£ s d		
G.E.C. Ord.	£1	48/9xd	−3d	14	12½	5 2 6	58/9	48/9
G.E.C. 6½ Pref.	£1	20/6		6½	6½	6 6 9	23/6	20/6
General Cables	5/-	15/6		30	30	9 13 6	15/6	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	47/6	45/3
Hackbridge Holdings	5/-	15/3	+3d	30	20	6 11 3	21/9	15/-
Hackbridge & Hewittic	5/-	13/9		23	20	7 5 6	16/-	13/6
Head Wrightson	£1	137/6	−2/6	20	22½	3 5 6	146/3	112/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	14/3	−9d	11½	11½	8 1 6	17/-	14/3
Holophane	5/-	23/9		30	30	6 6 3	26/3	17/-
Hoover	5/-	38/-xd	−1/9	50	50	6 11 6	44/-	24/9
I.C.I.	£1	42/3	−2/9	10	10	4 14 9	46/6	37/9
Intl. Combustion	5/-	25/6	−1/-	20	22½	4 8 3	30/-	20/-
Johnson & Phillips	£1	27/-		15	10	7 8 3	34/6	27/-
Lancashire Dynamo	£1	40/-	−1/3	11	11	5 10 0	45/-	36/9
Laurence, Scott	5/-	17/9	+6d	15	15	4 4 6	19/9	13/9
Lister, R. A.	£1	31/3	−9d	10	10	6 8 0	33/9	26/9
London Elec. Wire	£1	48/-		12½	12½	5 4 3	53/9	43/-
Lucas, J.	£1	33/3	+3d	7½	7½	4 10 3	36/6	30/6
Marconi Marine	£1	36/6	−6d	10	10	5 9 6	37/-	31/-
Marryat & Scott	2/-	12/6		30	35	5 12 0	13/-	8/-
Mather & Platt	£1	58/9		15	15	5 2 3	63/9	51/3
Metal Industries	£1	26/6	−1/-	Nil	9	6 15 9	30/-	20/3
Midland Elec. Mfg.	£1	50/-	+1/3	12½	12½	5 0 0	50/-	45/-
Morphy-Richards	4/-	18/3	−1/3	50	50	4 7 9*	20/-	11/9
Murex	£1	71/3xd		20	20	5 12 3	79/6	65/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/9xd		17½	17½	6 7 3	2/9	2/3
Parnall (Yate)	5/-	7/-	−3d	12	12	8 11 6	8/9	5/9
Parsons, C. A.	£1	63/9	−2/6	10	8½*	—	71/3	50/6
Plessey	10/-	76/-	−1/6	27½	30	3 19 0	86/3	61/-
Pye " A " Deferred	5/-	16/3xd	−2/-	12½	12½	3 17 0	20/-	15/9
Reyrolle	£1	98/-	−2/-	16½	17½	3 11 6	110/-	90/-
Rheostatic	4/-	9/-		18½	12½*	5 11 0	10/-	8/9
Richardsons Westgarth	5/-	18/6	−3d	16½	16½	4 10 0	20/-	17/-
Scottish Cables	4/-	18/3		27½	27½	6 0 6	19/3	15/-
Simon-Carves	5/-	31/3	−3/-	28½	20*	3 4 0	36/3	26/-
Smith (England), S.	4/-	15/-		17½	17½	4 13 3	15/9	13/-
Southern Areas	£1	15/6		7½	7½	9 13 6	20/-	13/9
Strand Elec.	5/-	7/3		15	15	10 6 9	8/-	7/3
Sturtevant	5/-	22/9	−3d	15†	15†	3 6 0†	27/-	22/9
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	13/6	−3d	25	25	9 5 3	15/6	13/6
Taylor Tunnicliff	5/-	12/3	−6d	15	15	6 2 6	13/9	11/9
T.C.C.	10/-	40/-		25	25	6 5 0	40/-	35/-
T.C. & M.	£1	26/-	+1/-	8½	8½	6 10 9	31/-	24/6
Telephone Mfg.	5/-	5/6	−3d	10	10	9 1 9	8/-	5/6
Telephone Rentals	5/-	11/6	−6d	12½	12½	5 8 9	12/6	10/3
Thompson (John)	5/-	33/-		25	25	3 15 9	37/-	29/3
Thorn Elec.	5/-	25/-	+6d	15	17½	3 10 0	26/3	16/3
Thornycroft	£1	27/6	−1/3	15	12½	9 1 9	37/6	27/6
Tube Investments	£1	67/6	+6d	22½	15*‡	4 9 0	68/9	58/3
Vactric	5/-	20/-		17½	25	6 5 0	23/9	12/9
Veritys	5/-	9/-	+1/-	12½	12½	6 19 0	9/3	8/-
Walsall Conduits	4/-	13/6		20	20	5 18 6	15/-	11/-
Ward & Goldstone	5/-	57/6xd	+2/6	35	40	3 9 6	57/6	36/9
Watford	2/-	6/6		25	25	7 13 9	6/9	6/3
Westinghouse	£1	37/6		18	9‡	4 16 0	41/3	36/-
West, Allen	5/-	11/6	−1/-	15	15	—	13/6	9/6
Wolf Electric	5/-	11/-		20	20	4 10 9*	13/6	8/9

Pye Earnings

The Pye company has passed on to the public none of the wage increases of the last three years. This point is made in the statement accompanying the preliminary results for 1956–57, which record a reduction in group profits (before tax) from £2·33 to £1·68 million. Apart from the contraction of profit margins, contributory factors were the effects of the credit squeeze and substantial losses resulting from the Suez trouble. Shareholders had been warned at last year's annual meeting to expect lower profits in the twelve months ended in March, but the price of the 5s shares was marked down fairly sharply to 16s 3d, ex-dividend, after the news. At this level there is a yield of just under 4 per cent on the basis of the dividend which is maintained at 12½ per cent.

Wright and Weaire

Introduced to the market less than two years ago, the 5s shares of Wright & Weaire, have lately come in for fresh attention. The price improved to 18s 6d when notice was called to the yield of over 8 per cent on the basis of the 30 per cent dividend paid for 1956. In this year's annual report, the forward order book was said never to have been fuller and records were expected in exports, which last year accounted for more than 30 per cent of the company's production. A majority shareholding in the company has been acquired lately by Wilmot Breeden (Holdings), Ltd.

Efco Progress

The 10s shares of Efco, Ltd., have been dealt in at around 22s since the announcement of the results for 1956–57. These fulfilled well the forecast of a satisfactory increase in profits on the occasion of a share issue in March, the net profit (despite a much larger tax deduction) being some £26,000 to the good at £124,000, which includes pre-acquisition profits of £13,000 relating to shares in Royce Electric Furnaces. Part of the object of the capital issue was to finance the purchase of the 51 per cent of that company's capital not already held by Efco. The new shares qualify for the final dividend now declared, bringing the year's payment to the same total of 12½ per cent as was paid previously on the smaller capital. The yield on the shares is nearly 5¾ per cent.

REPORTS and DIVIDENDS

Cable & Wireless, Ltd.—The report and accounts for the year to 31st March last have been published by H.M. Stationery Office (1s net). The total revenue is £13,690,215, as compared with £12,926,451 for 1955-56, and after meeting all charges, but before taxation, the profit is £2,229,408 (against £2,183,983). The following appropriations have been made:—Taxation, £1,570,449; capital reserve in respect of tax relief on investment allowances, £22,750; dividend of 4 per cent (unchanged), £690,000. The amount by which the dividend exceeds net earnings is £53,791, reducing the balance carried forward to £542,522.

Thorn Electrical Industries, Ltd.—The group trading profits for the year ended 31st March last amounted to £2,121,249, as compared with £1,736,788 in the previous year. After deducting all charges, including depreciation of £483,486 and taxation of £699,181, the net profit is £635,056 (£572,137), subject to audit. The directors recommend a dividend for the year on the ordinary shares of 17½ per cent (against 15 per cent).

The Hackbridge & Hewittic Electric Co., Ltd.—The annual meeting was held on 8th August. In his circulated statement, Mr. A. M. Browne (chairman and managing director) said that output had been maintained during the year under review at about the same figure as for each of the two previous years. The fall in profits had been due mainly to unavoidable increases in costs of wages and materials whilst prices of finished products had not risen correspondingly and in some cases had actually fallen. Benefits from capital expenditure and development work had to a considerable extent helped to offset the reduced profit margins. Orders had been received at a good rate and it had been a record year from that point of view, the value of orders in hand being 30 per cent in excess of the corresponding figures twelve months ago. At home the C.E.A. and Area Boards had been the main purchasers of transformers and the company had supplied transformers covering all the range of units wanted, including some of the largest size for the 275 kV supergrid.

In the Rectifier Division the contract for rectifiers for the frequency change-over programme of the Southern Region of British Railways, which was started in 1952, was completed during this year. British Railways had since placed a contract for similar plant for extension of the Southern Region network entailing thirty-one new substations with a total capacity of 80,000 kW. They had also during the year supplied more plant for the London Transport Executive, including the plant for the largest glass bulb rectifier substation in its system, at Charing Cross (9,000 kW now, later to be increased to 12,000 kW). The value of exports in this division had been as high as 60 per cent, mostly to the United States, Canada, India and Australia.

Their comprehensive development programme included transformers for higher voltage work, in the 300 kV field as a first stage. This was now being pursued for 400 kV. In connection with the British Railways decision to adopt alternating current for the supply to the overhead lines in future extensions, they had set themselves the problem of making a new type of mercury arc unit of such size and construction as to be suitable for mounting on locomotives or railway motor coaches, and a considerable measure of success had already been achieved. A development section had also been set up in connection with alternative forms of rectifier plant, such as the selenium type or dry plate rectifier, and the more recently introduced germanium and silicon junctions.

Oldham & Son, Ltd.—The report and accounts for the year ended 31st March last show a consolidated trading profit of £592,553, as compared with £512,995 for 1955-56, to which is added income from investments and profit on sale of assets, making £595,191. After meeting all charges, including £206,630 for taxation, the net profit is £246,067 (against £192,843). From this is deducted dividend on outside shareholdings of a subsidiary company and undistributed profits attributable to outside shareholdings, leaving £183,130, to which are added provisions for taxation in previous years no longer required (£20,000) and undistributed profits at the beginning of the year (£211,523), making £414,653 available. General reserve receives £68,280 and it is proposed to pay a final ordinary dividend of 10 per cent, maintaining the distribution for the year at 17½ per cent. The balance carried forward is £270,045.

In his statement which accompanies the report and accounts, Mr. J. Oldham (chairman) says that during the period of petrol rationing their sales of car batteries were inevitably affected, but the effect was considerably less than might have been anticipated. Such fluctuations as did occur were compensated by increased business in other sections of the sales. The mine-lighting side of the business has been well maintained and production in the Fibrak separator division has increased considerably. Tooling up for the double-sleeve power battery (known as the "Pg" type) has been in progress during the year and production has now commenced. In the electrical section work has continued throughout the year to expand their products. Sales of these are increasing and production potential is being increased to meet the new requirements. The group is now producing a full range of emergency lighting equipment for industrial and public buildings. It is also manufacturing battery chargers of all types, power supply units for mine shaft signalling, transformer-rectifier equipments for schools and laboratories and other ancillary electrical equipment.

Overseas sales of the group have again increased during the year under review. The operations of the subsidiary manufacturing companies overseas continue to increase, as does their contribution to the profits of the group.

The Radio & Television Trust, Ltd., reports a consolidated profit for the year ended 31st March last of £80,419, as compared with £82,203 for the preceding year. Taxation absorbed £42,750 and the net balance is £34,714 (against £44,264). The adverse balance on the profit and loss account at 31st March, 1956, was extinguished under the scheme of arrangement which became effective on 18th March last. An ordinary dividend of 12½ per cent is recommended.

Pye, Ltd., reports a fall in profits, before taxation, from £2,331,848 to £1,680,660 and in the net profit from £1,071,489 to £685,072. The dividend on the deferred and "A" deferred stocks is, however, maintained at 12½ per cent. The worsened results are attributed by Mr. C. O. Stanley, the chairman, to reduced profit margins, the effects in some directions of the credit squeeze and losses caused by the Suez affair.

The English Electric Co., Ltd., is maintaining its interim ordinary dividend at 4 per cent on increased capital.

Increase of Capital

Semiconductors, Ltd. — Increased by £499,900, in 244,900 "A" and 255,000 "B" shares of £1 each, beyond the registered capital of £100.

Liquidations

Harry Winter (Leeds), Ltd., plumbing and electrical contractors.—Winding up. Liquidator, Mr. J. H. Rhodes, 7, Greek Street, Leeds, 1, appointed 24th July.

"Gammatron" Nucleonics, Ltd., dealers in nucleonic equipment.—Winding up voluntarily. Liquidator, Mr. R. W. Lloyd, 35, Old Jewry, London, E.C.2, appointed 24th July.

Michael Dix, Ltd., electrical contractors.—Winding up. Liquidator, Mr. E. C. Greenbury, Sweden House, 13, Stratford Place, London, W.1.

Bankruptcies

N. Sherman and **B. Bercovici**, lately trading together as B.B. Radio & Television Service at 168, Roman Road, London, E.2, radio, television and electrical equipment dealers.—Receiving order made 29th July on debtors' own petition.

L. Bloom, formerly carrying on business in partnership with another under the style of Bloom Bros., at 12, Duke Street, St. James's, London, electrical engineers.—Last day for receiving proofs for dividend 19th August. Trustee, Mr. G. F. Morris, Bankruptcy Buildings, Carey Street, London, W.C.2, Senior Official Receiver.

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Electronic Rectifiers with single anode mercury vapour bulbs

Up to 75kW for industrial and laboratory use

All rectifiers in Philips wide range are noted for:

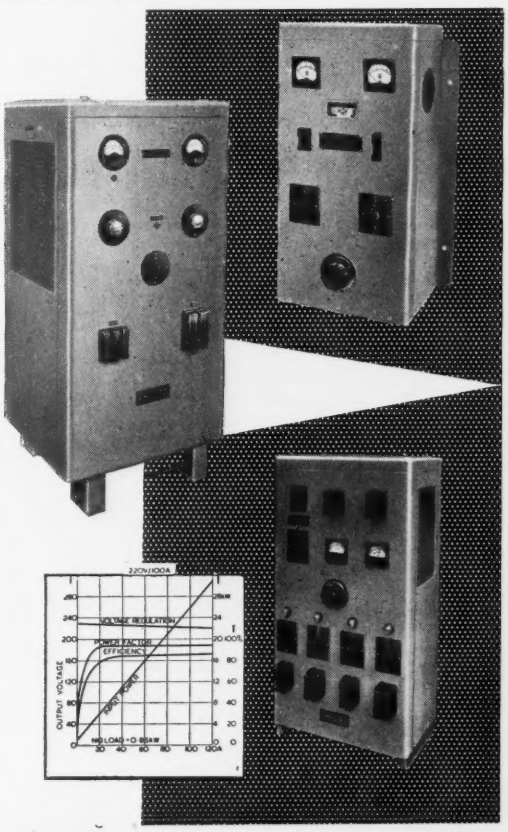
- *High efficiency and long life with single anode mercury vapour bulbs;*
- *low initial cost;*
- *reliable service with minimum attention, due to absence of moving parts.*

General characteristics of a typical Philips Rectifier can be seen from the graph on right, showing a rectifier designed to operate from 3-phase supply and giving up to 100 amps at 220/230 volts DC.

The curves indicate:

(*a*) Excellent voltage regulation obtained from light load up to overload.
(*b*) Maintenance of high efficiency even at partial load.
(*c*) Small 'no load' loss.
(*d*) High power factor, well maintained at partial loads.

Rectifiers can be constructed to individual requirements or to fit into existing site conditions. If you would like our technicians to visit your premises and advise you without obligation, or if you require further details of our range of rectifiers, please write to address below.



PHILIPS ELECTRICAL LTD

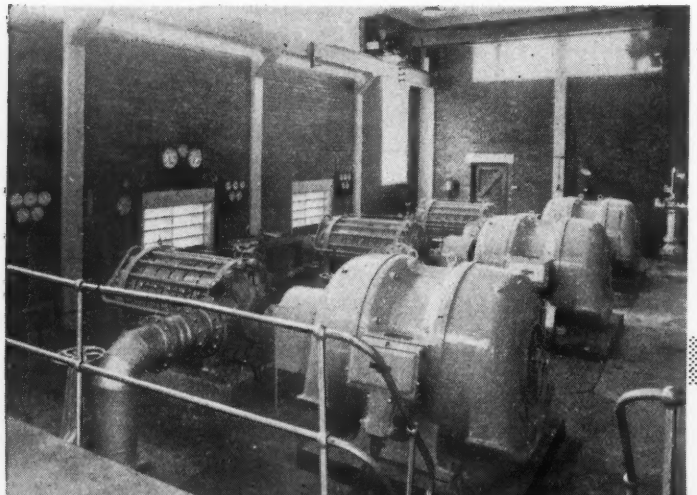
ELECTROTECHNICAL DEPARTMENT

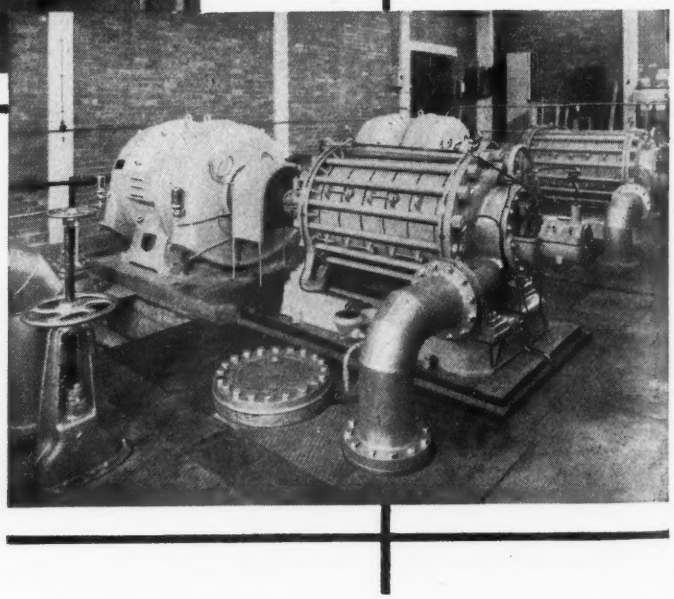
CENTURY HOUSE · SHAFTESBURY AVENUE · LONDON W.C.2

(PRO089B)

The Pump House is unattended—

The continuous trouble-free operation of Metrovick motors is usually taken for granted, which is itself a tribute to the company's reputation for reliability. For example in the Wilge Dam pump house in South Africa the 870-hp 6.6 kV squirrel cage motors are remote controlled from the power station which is some distance away. The experience of Metropolitan-Vickers covers every aspect of motor drives for pumping duty and power station auxiliaries in all parts of the world. Call on the advice and experience of Metrovick engineers for rapid and efficient solutions to every problem of motor drives.





In this illustration are seen 870-hp, 1480-r.p.m., 6.6 kV type RS squirrel cage motors driving Allen pumps. The pump house supplies all the water for the station requirements and also for domestic purposes.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

Metrovick Motors For Pumping Duty Auxiliaries

J/A607

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 21st August from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

105. Postmaster General.—Electronic telephone exchange systems. 17th December, 1952. (781561.) 106. Pulse distributing systems. 5th December, 1952. (781562.)

25601. Metropolitan-Vickers Electrical Co., Ltd.—High frequency electrical generators for dielectric heating. 22nd September, 1953. (781444.)

1953

11211. Philco Corporation.—Amplitude selection circuits for signals comprising pulses. 23rd April, 1953. (781569.)

12463. General Electric Co.—Transistor amplifiers. 5th May, 1953. (781570.)

20541. United Kingdom Atomic Energy Authority.—Nuclear reactors. 21st July, 1954. (781648.)

25086. Hotpoint Electric Appliance Co., Ltd.—Electric plug connectors. 10th September, 1953. (781571.)

32940. Electric & Musical Industries, Ltd.—Circuits for generating a d.c. voltage from recurrent pulses. 4th November, 1954. (781649.)

35472. National Research Development Corporation.—Resonant electronic circuits. 21st December, 1954. (781374.)

1954

769. British Thomson-Houston Co., Ltd.—Electric discharge devices. 29th December, 1954. (781575.)

6092. General Electric Co., Ltd.—Electric circuit arrangements for operating cathode-ray tubes. 1st March, 1955. (781577.)

15916. Hunt (Capacitors), Ltd., A. H.—Dielectric materials. 27th May, 1955. (781470.)

16537. Cole, Ltd., E. K., and Burnard, C. L.—Interference suppression arrangements for radio receivers. 3rd June, 1955. (781582.)

17434. Telephone Manufacturing Co., Ltd.—Polarised electromagnetic relays. 9th June, 1955. (781641.)

18418. British Insulated Callender's Construction Co., Ltd.—Construction of overhead electric power lines. 23rd September, 1955. (Cognate application 27653, 24th September, 1954.) (781473.)

20823. Metropolitan-Vickers Electrical Co., Ltd.—Electrical spark gap discharge apparatus. 6th July, 1955. (781378.)

21698. British Ceramic Research Association.—Electrically heated kilns or furnaces. 25th July, 1955. (781587.)

28084. Tucker & Co., Ltd., J. H.—Boxes for fixing electric switch mechanism and the like in hollow walls and panels. 29th September, 1955. (781592.)

29300. Mullard Radio Valve Co., Ltd.—Transistor circuit arrangements for providing a stabilised d.c. output. 5th January, 1956. (781593.)

31834. Telephone Manufacturing Co., Ltd.—Electromagnetic relays and similar devices. 20th October, 1955. (781642.)

31862. Hammond, E.—Electric storage batteries. 4th November, 1955. (781596.)

34742. Ferranti, Ltd.—Plug-in units carrying electrical components. 24th November, 1955. (781601.)

1955

1084. General Electric Co., Ltd.—Metal-clad vapour electric arc convertors. 3rd January, 1956. (781704.)

1568. Anderson Manufacturing Co., A. & J. M.—Readily detachable electrical cable connectors. 18th January, 1955. (781606.)

1862. Belling & Lee, Ltd.—Pin and socket type electrical connectors. 19th January, 1956. (Addition to 649739.) (781607.)

2524. British Thomson-Houston Co., Ltd.—High frequency electric coupling arrangements. 17th January, 1956. (781705.)

2810. English Electric Co., Ltd.—Condensing steam turbines. 27th January, 1956. (781505.)

3390. Bendix Aviation Corporation.—Telemetering systems for transmitting data to a remote point. 4th February, 1955. (781507.)

3717. Philips Electrical Industries, Ltd.—Electrodes for electron discharge devices. 8th February, 1955. (781385.)

4088. Automatic Telephone & Electric Co., Ltd.—Terminal arrangements for electrical components. 25th January, 1956. (781610.)

4598. English Electric Valve Co., Ltd.—Thermionic valves. 1st November, 1955. (781387.)

5490. British Insulated Callender's Cables, Ltd.—Electric branch connections. 22nd February, 1956. (781614.)

6773. New Britain Machine Co.—Electric control switch adapted for control movement of a machine tool element. 8th March, 1955. (781388.)

6957. Metropolitan-Vickers Electrical Co., Ltd.—Electrically heated vessels. 22nd February, 1956. (781323.)

7273. British Broadcasting Corporation.—Circuits for quantising the waveforms of electric signals. 15th February, 1956. (781325.)

12014. Philips Electrical Industries, Ltd.—Lighting fittings comprising a tubular light source. 26th April, 1955. (781391.)

13298. Marconi's Wireless Telegraph Co., Ltd.—Television transmitters. 17th February, 1956. (781713.)

13882. Western Electric Co., Inc.—Time assignment signal interpolation systems. 13th May, 1955. (781622.)

17633. Telefonaktiebolaget L. M. Ericsson.—Apparatus for representing an input voltage in the form of a code. 17th June, 1955. (781394.)

20615. Accumulatorenfabriek Varta N.V.—Separator for the plates of an electric accumulator, particularly an alkaline accumulator. 15th July, 1955. (781629.)

21723. General Electric Co.—Transistor amplifiers. 27th July, 1955. (781666.)

24007. Standard Telephones & Cables, Ltd.—Multi-switch on the cross-bar principle. 19th August, 1955. (781738.)

28131. Hazeltine Corporation.—Colour saturation control apparatus. 3rd October, 1955. (781537.)

31099. British Thomson-Houston Co., Ltd.—Electric arc furnaces. 31st October, 1955. (781639.)

31197. Philips Electrical Industries, Ltd.—Electromagnetic relays. 1st November, 1955. (781542.)

31895. Standard Telephones & Cables, Ltd. (International Telephone & Telegraph Corporation).—Variable electrical phase shifters for circularly polarised waves. 8th November, 1955. (781672.)

32283. Standard Telephones & Cables, Ltd.—Electric wave filters of lattice type having attenuation poles. 11th November, 1955. (781360.)

32659. Bugnor, A. P.—Electric flash bulb holder having a bulb ejector. 15th November, 1955. (781546.)

34316. General Electric Co.—Pool-type electric discharge devices. 30th November, 1955. (781410.)

1956

1227. Standard Telephones & Cables, Ltd.—Co-ordinate switching unit. 13th January, 1956. (781553.)

1630. Lancashire Dynamo & Crypto, Ltd., Butler, O. I., Barton, T. H., and Sterling, H.—Multi-phase induction motors. 17th January, 1956. (781682.)

1862. Metropolitan-Vickers Electrical Co., Ltd.—Dielectric heating apparatus. 29th September, 1953. (Divided out of 781443.) (781445.)

4264. Standard Telephones & Cables, Ltd.—Polarised electromagnetic system. 10th February, 1956. (781687.)

5496. Western Electric Co., Inc.—Electric switch contact wiper spring and method of making same. 22nd February, 1956. (781557.)

1957

8191. Postmaster General.—Time division multiplex communication systems. 17th December, 1952. (Divided out of 781561.) (781563.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 24th August:

PENTACON. No. 754,502. PENTAX. No. 754,505. Class 9. Electro-technical, signalling, cinematographic and radio apparatus, etc. —Veb Zeiss Ikon, Dresden, Germany. Address for service, c/o Matthews, Haddon & Co., 31-32, Bedford Street, Strand, London, W.C.2.

FERRANTI. No. 762,422. Class 9. Television receivers and tuner units, remote control units and preamplifiers for television receivers. —Ferranti, Ltd., Wickentree Lane, Hollinwood, Lancs.

ZIP. No. 763,474. Class 9. Electrical apparatus and instruments; switches, sockets, combined switches and sockets, plugs and safety fuses (cut-outs); push-buttons for bells; and parts. ZIP. No. 763,475. Class 11. Installations for lighting, cooking, refrigerating, drying, ventilating and sanitary purposes; and electric lamps and electric lighting fittings and parts.—S. G. Young, 154, Blackfriars Road, London, S.E.1.

REGENCY. No. 763,820. Class 9. Electric vacuum cleaning apparatus and parts and fittings.—Bylock Electric, Ltd., 109, South Street, Enfield, Middx.

JUMBO (design). No. 764,128. Class 9. Radio and television apparatus, loudspeakers and phonographs.—Hauptmann K.G., Hamburg-Altona, Germany. Address for service, c/o J. Longman, Jessel Chambers, 88-90, Chancery Lane, London, W.C.2.

MICROTROL. No. 764,526. Class 9. Indicating apparatus and instruments for inspection and control; and electrical apparatus for use in the automatic control of machines or of industrial processes, etc.—British Thermostat Co., Ltd., Teddington Works, Windmill Road, Sunbury-on-Thames, Middx.

CECO AUDITEL. No. 765,339. Class 9. Sound amplifiers for use with telephones; and sound reproducing apparatus. — C. H. Crawford, trading as Ceco Products, 19a, Whittall Street, Birmingham, 4.

VAPOLATOR. No. 762,232. Class 11. Electrically heated caps for use in hairdressing (not being parts of machines); and hair drying appliances (not machines).—Indola, N.V., Voorburg (South-Holland), Netherlands. Address for service, c/o E. N. Lewis & Taylor, Berridge Street Chambers, 4, Berridge Street, Leicester.

SANABURN. No. 765,549. Class 11. Electric incinerators.—Stratton & Brodie-Chase, Ltd., 7, Victoria Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Atcham.—R.D.C. 30th August. Duplicate electrically driven booster pumping plant and equipment at Plex Green, Minsterley. J. R. Sockett, surveyor, 24, St. John's Hill, Shrewsbury.

Basildon.—U.D.C. 2nd September. Street lighting installation. (See this issue.)

Belfast.—Northern Ireland Ministry of Finance. 20th August. Electrical installations at new farmyard extensions, Loughry Agricultural College, Cookstown.

Belgium.—Ministère de la Défense Nationale, Brussels. 20th August. Electric oven for drying "tropicalised" parts. (E.S.B. 18737/57. Ten/27387.)* 5th September. Replacement parts for aerodrome electrical installation, including loading rheostats, lamps, voltmeters, frequency meters, etc. (E.S.B. 19211/57. Ten/27414.)*

Ceylon.—Tender Board, Ministry of Health, Colombo. 24th September. Portable generating plants, sound projectors and accessories, public address systems, tape recorders and public health inspection kits. (E.S.B. 19203/57 I.C.A. Ten/27385.)*

Denmark.—Tribunal of Disablement Insurance, Copenhagen. 6th September. 17,000 hearing aids. (E.S.B. 18127/57. Ten/27262.)*

Farnham.—U.D.C. 10th September. Street lighting equipment. (See this issue.)

Folkestone.—Corporation. 5th September. Street lighting equipment. (See this issue.)

Formosa.—Central Trust of China, Taipei. 31st August. Telephone line equipment and tools. (E.S.B. 18954/57 I.C.A. Ten/27343.)* 3rd September. Radio and telephone equipment. (E.S.B. 18959/57 I.C.A. Ten/27322.)*

Greece.—Import Supply Committee, Social Insurance Institute, Athens. 19th September. Fourteen X-ray units. (E.S.B. 19345/57. Ten/27411.)*

Holywood (Co. Down).—Board of Governors of Sullivan Upper School. 22nd August. Electrical installation at the school. Scottish Boiler and General Insurance Co., Ltd., consulting engineers, 10, Donegall Square South, Belfast.

India.—Director General, Supplies and Disposals, New Delhi. 22nd August. Copper wire. (E.S.B. 18671/57. Ten/27269.)*

Kinross.—County Council. 24th August. Installation of sodium discharge lamps, Milnathort. (See this issue.)

Limavady (Co. Londonderry).—Northern Ireland Hospitals Authority. 26th August. Electrical engineering services for improvements scheme at Roe Valley Hospital. W. & M. Given, consulting engineers, 1, Waterside, Coleraine.

Mold.—U.D.C. 24th August. Street lighting schemes. Surveyor, Town Hall.

Newcastle-on-Tyne.—Education Committee. Electrical work in connection with alterations to the College of Further Education, Bath Lane, Newcastle-on-Tyne. City education architect, Northumberland Road.

New Zealand.—G.P.O., Wellington. 12th September. Potentiometers and resistors. (E.S.B. 18892/57. Ten/27321.)*

Auckland Electric Power Board. 27th September. Two 12,000 kVA transformers. (E.S.B. 19021/57. Ten/27366.)*

Pakistan.—Posts and Telegraphs Department. 9th September. Alarm fuses. (E.S.B. 19157/57. Ten/27396.)*

South Africa.—Cape Town Corporation. 1st November. Coal handling, storing and reclaiming plant for Athlone power station. 15th October. Dust and ash handling plant for Athlone power station. (E.S.B. 19017/57. Ten/27328.)*

Pretoria City Council. 10th September. Trolley-buses. (E.S.B. 18868/57. Ten/27314.)*

Stores Department, South African Railways, Johannesburg. 4th September. Outdoor transformers ranging from 5 to 50 kVA. (E.S.B. 19160/57. Ten/27378.)* 6th September. Lead acid station type batteries. (E.S.B. 19183/57. Ten/27382.)*

Union Tender and Supplies Board. 12th September. Underground polyethylene insulated and sheathed cable. (E.S.B. 19398/57. Ten/27421.)*

Southern Rhodesia.—Federal Tender Board, Causeway. 23rd August. Electric lamps. (E.S.B. 19363/57. Ten/27410.)*

Turkey.—Allied Land Forces, South Eastern Europe, Izmir. 26th August. Telephones. (E.S.B. 19004/57. Ten/27350.)*

Whitley Bay.—U.D.C. Installation of electricity in two blocks of flats, comprising 28 dwellings, at The Fold, Monkseaton. E. Roberts, borough engineer, Municipal Buildings, Whitley Bay.

Yorkshire.—Yorkshire Electricity Board. Cables. (See this issue.)

ORDERS PLACED

Carlisle.—City Council. Supply and erection of 120 steel lighting columns with lanterns and mercury vapour lamps in London Road, etc. (£7,639).—G.E.C.

London.—North West Metropolitan Regional Hospital Board. Phase II of the rewiring of Upton Hospital (£3,385).—Southern Electricity Board. Improvements to electricity supply at Shenley Hospital (£6,455).—Eastern Electricity Board. Change-over to a.c. supply at Heatherwood Orthopædic Hospital (£10,571).—G. W. Day & Co.

Middlesbrough. — Newcastle Regional Hospital Board. Electrical installation work in a new wing at Middlesbrough General Hospital (£33,173).—A. Anderson & Sons.

Yeovil. — Corporation. Recommended. Supply and erection of equipment for conversion of street lighting from gas to electricity (£8,072).—Revo Electric Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Alloa.—Houses (80), Inglewood; Scottish Special Housing Association, Ltd., 15-21, Palmerston Place, Edinburgh, 12.

Atherton.—Houses (110), Hagfold North; U.D.C. surveyor, Town Hall.

Barking.—Works for Fina Petroleum Products, Ltd.; W. & C. French, Ltd.. contractors, Epping New Road, Buckhurst Hill.

Bedford.—Six-storey block of 37 flats and eight maisonnettes, Central Area, and bungalows (25), Putnoe estate; F. W. Dawkes, borough engineer, Newnham House, Horne Lane.

Birmingham.—Additions to two wards at Rubery Hill Hospital (£66,000) and group laundry at Selly Oak Hospital (£55,700); Regional Hospital Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Bristol.—Additional works, Somerset Street; Mardon, Son & Hall, Ltd., Temple Street.

Cardiff.—Home for aged persons at Rumney (£75,000); city architect.

Durham.—Hostel at Consett (£40,000); county architect, South Street, Durham.

Edinburgh.—Erection of Gracemount Secondary School (£320,000), in two stages; Fairbrother, Hall & Hedges, architects to City Council, Rutland Square, Edinburgh.

Hendon.—Synagogue, classrooms, hall, etc., 11, Brent Street; Hendon Adath Yisrael Congregation, Brent Street, Hendon, N.W.4.

Hull.—Shops and offices, Tivoli Theatre site, for J. Girling, Ltd.; Robinson & Swadon, Ltd., builders, 95-97, Alexandra Road, Hull.

Leamington Spa.—Houses (51), St. Mark's Road; Morris & Jacombs, Ltd., builders, 71, Hobmoor Road, Birmingham.

Factory extension; Karobes, Ltd., Guy Place East.

London.—School for delicate children, Putney Park Lane; James Cubitt & Partners, architects, 25, Gloucester Place, W.1.

Shops, flats and maisonnettes, Church Street, Marylebone; Bridgwater & Shepheard, architects, 42, Bruton Place, W.1.

Flats (138), Braithwaite Place/Adpar Street redevelopment; borough engineer, Paddington Town Hall, W.2.

Manchester.—Hostel at Demesne Road, Whalley Range, for Y.M.C.A.; secretary, Divisional Office, 83, Bridge Street, Manchester, 3.

Middlesbrough.—Primary school at Pallister Park (£57,000); John McCreton, Ltd., builders, King's Road, North Ormesby.

Newcastle-on-Tyne.—Extensions to factory, Hunter's Road, for Tyne Clothiers, Ltd.; M. Gatoff, 26, Mosley Street.

Extensions and alteration to factory, Barrack Road, for J. Taylor Dunford & Co.; Cackett, Burns, Dick & McKellar, 21, Ellison Place.

Northolt. — Works extensions; Walter Kidde, Ltd., Belvue Road.

Northumberland.—Second instalment of technical college at Ashington (£347,000); Middlemiss Brothers, builders, Stepney Bank, Newcastle-on-Tyne.

Primary school at Gosforth (£110,000); T. Curry & Sons, builders, Meldon Street, Newcastle-on-Tyne.

New school at Coxlodge (£103,000); A. Anderson, Ltd., builders, Stanmore Road, Newcastle-on-Tyne.

Nuneaton.—Dwellings (58), Caldwell estate; borough surveyor.

Rotherham.—Extension of Technical College (£400,000); A. F. Scott & Sons, architects, 23, Tombland, Norwich.

Seaham.—Houses (68), Dene House Road estate; U.D.C. surveyor.

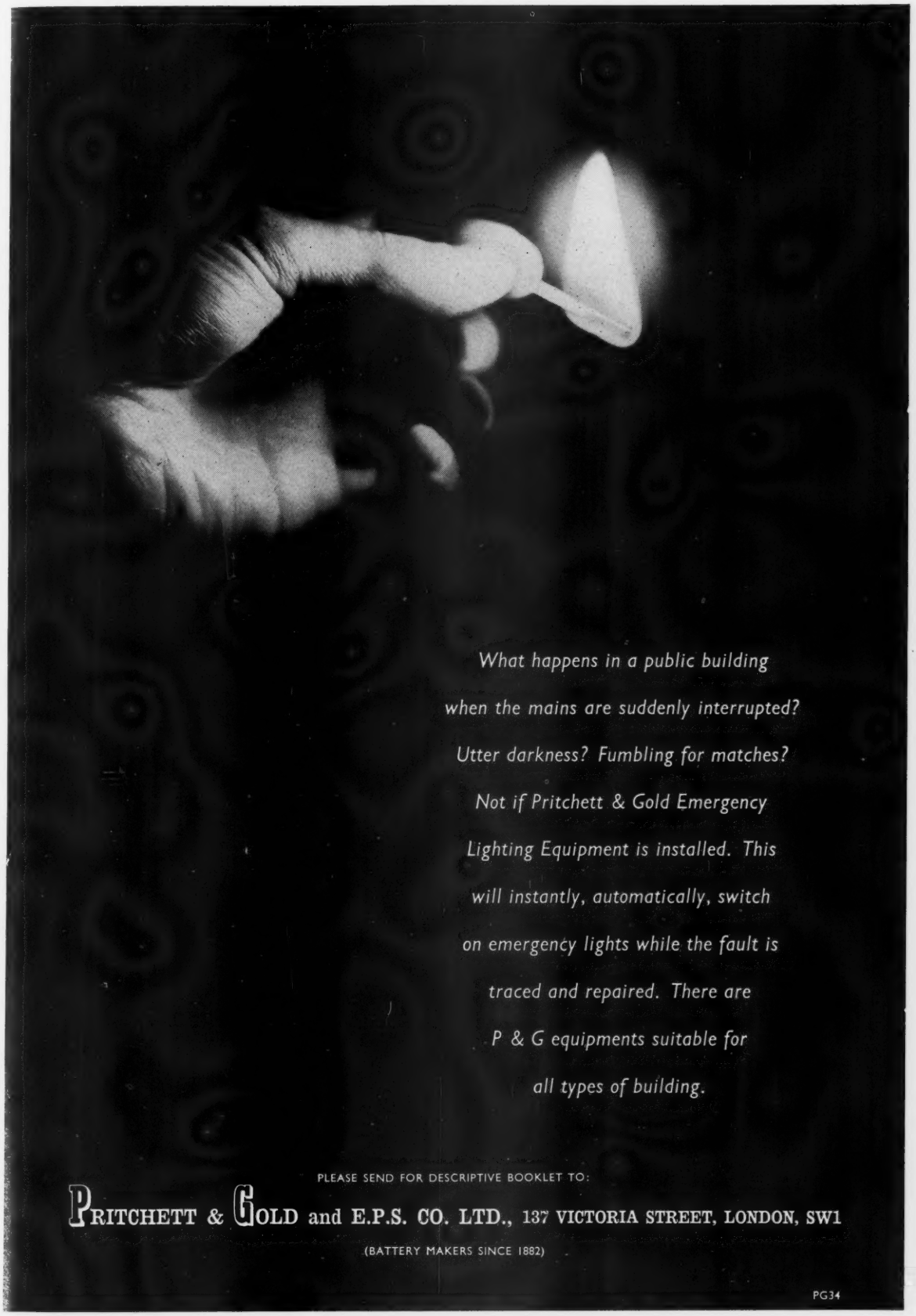
Sedgefield.—Houses (142), Windlestone, for R.D.C.; R. Dobson, housing architect.

Southampton.—Police hostel consisting of 30 bedrooms, recreation and training rooms, traffic branch headquarters, garages and workshops, Hulse Road; borough architect.

Dwellings (71), Thornhill and Sydney Road sites; borough engineer.

Southend-on-Sea.—Conference hall with stage, restaurant, etc.; borough architect, 30, Alexandra Street.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).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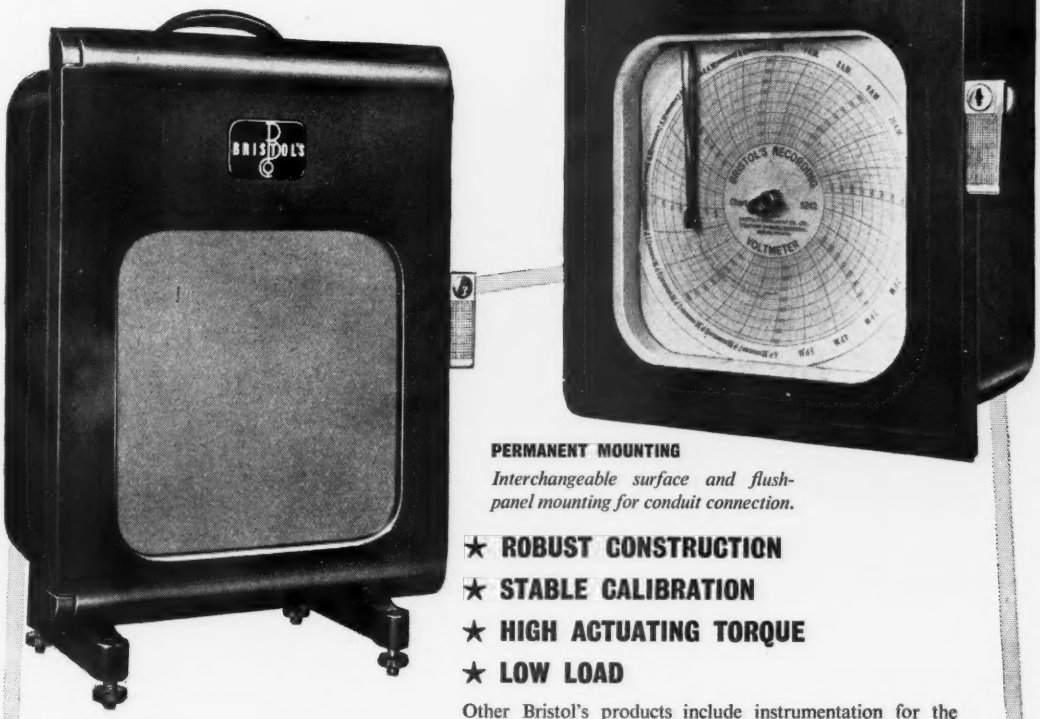

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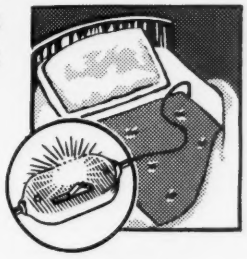

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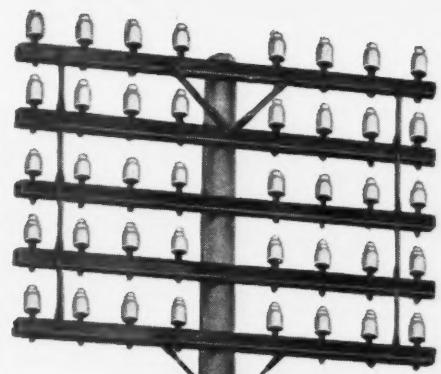

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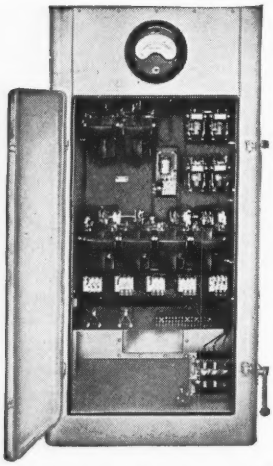

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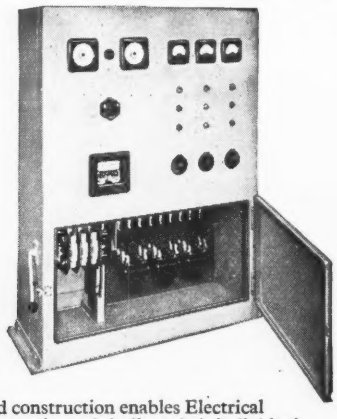

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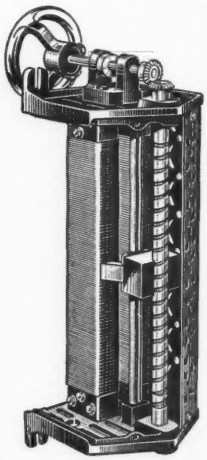

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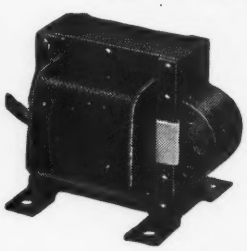

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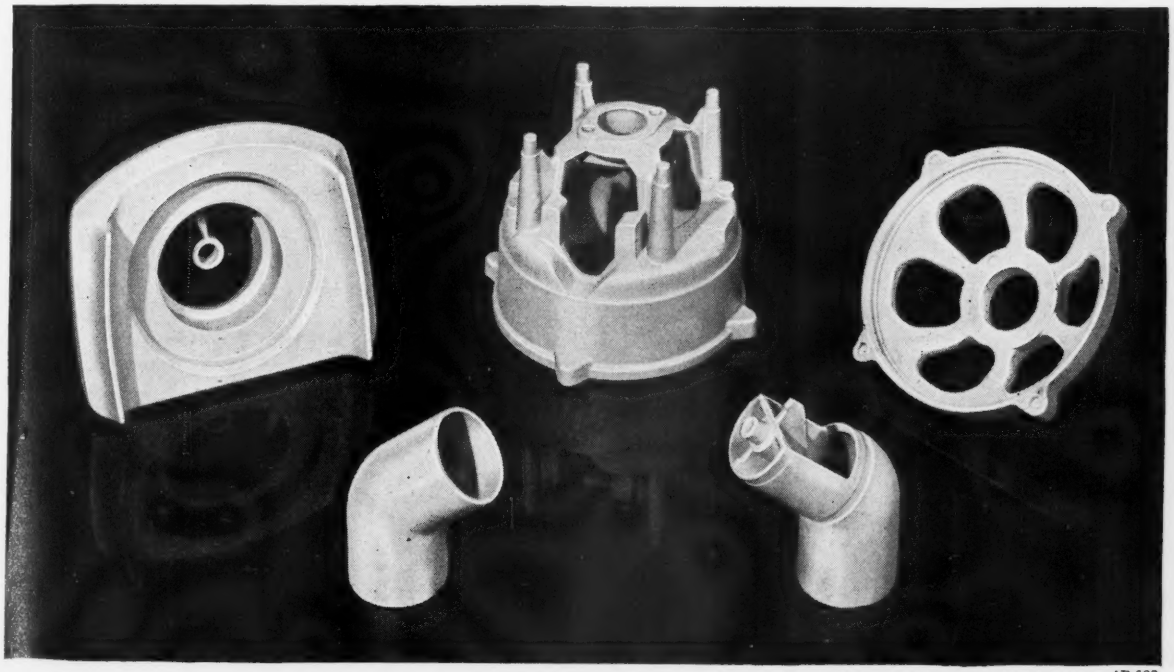

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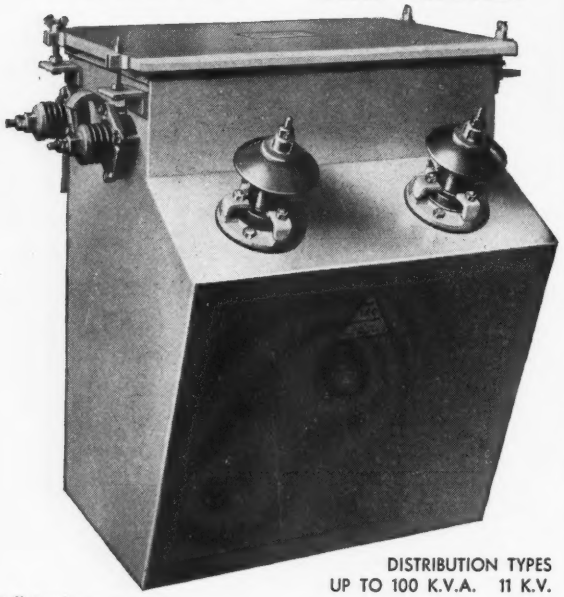

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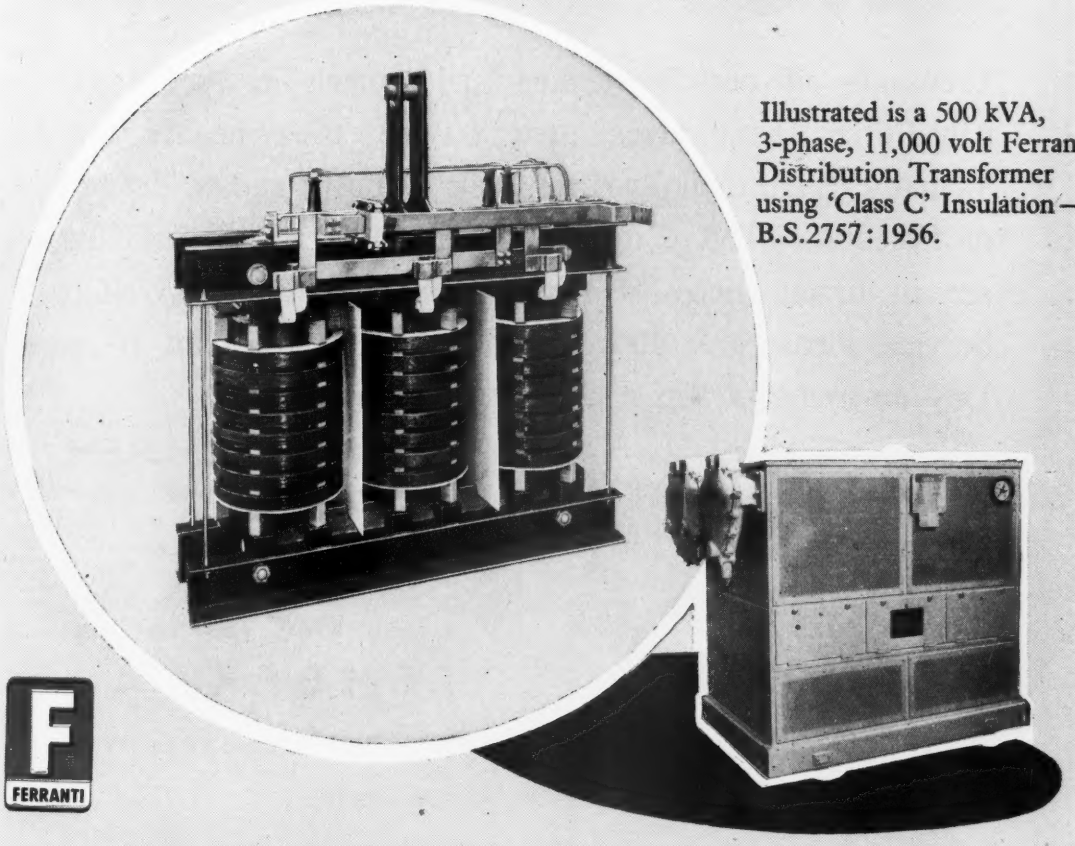

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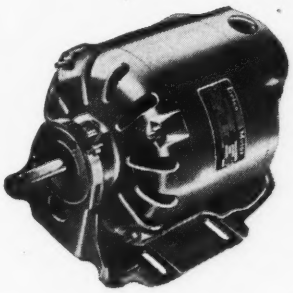

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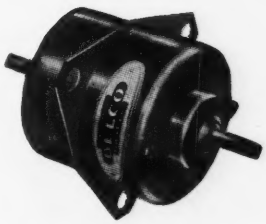
DELCO 310 TYPE



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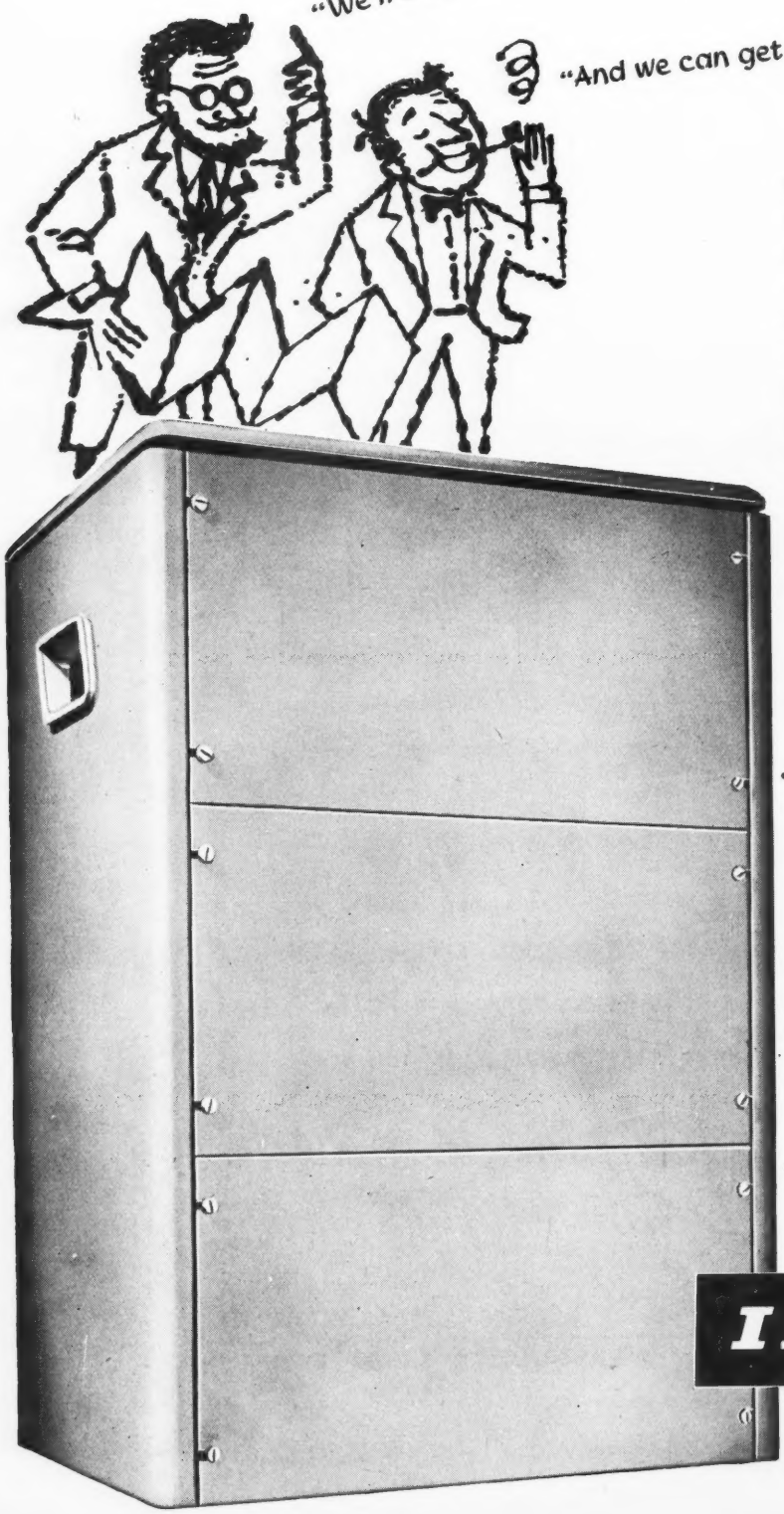

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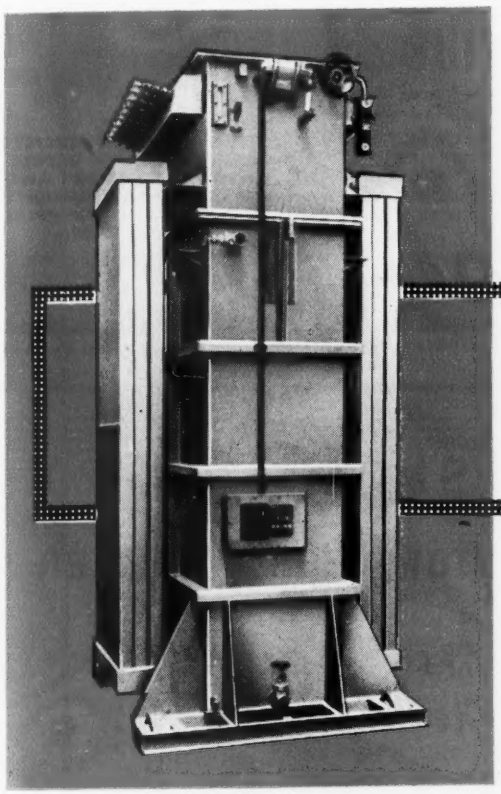

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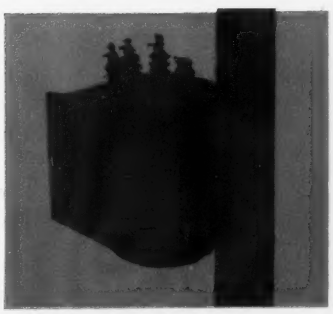

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The Tail End Booster will compensate for 25% voltage fluctuations and is available in ratings from 5 to 33⅓ kVA to maintain the voltage constant on single phase Low Volt distribution systems within 2% of the declared value.

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BRENTFORD TRANSFORMERS LIMITED • MANOR ROYAL • CRAWLEY • SUSSEX • CRAWLEY 25121

WHICH is WHICH?

You KNOW, but do your customers know?

To follow the "Safety First" recommendation, make sure your electrical leads, whether to Domestic Appliances or to Machine Tools, etc., are clearly defined. "Viskrings" simply slipped over the core-wires and/or the outer casing of the leads do the job and put an end to confusion or doubt.

- NO TOOLS REQUIRED
- NO RUBBER USED
- IMPERVIOUS TO OIL AND PETROL
- INDELIBLY PRINTED
- SUPPLIED IN ALL COLOURS AS WELL AS WHITE
- SELF-FIXING
- DO NOT INCREASE DIAMETER OF LEAD

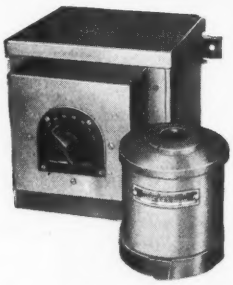
"VISKRINGS"

for PERMANENT IDENTIFICATION OF ELECTRIC LEADS

VISCOSE DEVELOPMENT CO. LTD.
40 CHANCERY LANE, LONDON, W.C.2
CHANCERY 3111

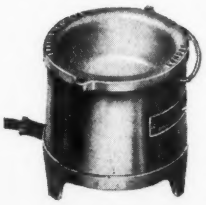
INSTALL 'B-W' WIRE STRIPPING & TINNING BATHS

two operations in one



The "B-W" range of Solder Pots, typical example seen on right, and Tinning Baths are extensively used by the electrical trades, including special types for PRINTED CIRCUITS.

This special high temperature pot, seen on left, strips and tins enamelled wire ends at one shot.



OTHER "B-W" PRODUCTS INCLUDE: VACUUM IMPREGNATORS, DRYING AND STOVING OVENS, HUMIDITY CABINETS, AND TROPICAL CHAMBERS, ETC.

Barlow-Whitney LTD

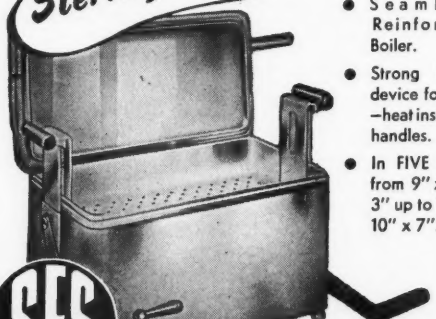
BARLOW WHITNEY LTD., 2 Dorset Square, London, N.W.1. Ambassador 5485
Works: London and Bletchley

B.M.J.

SURQUAL REGD

AUTOMATIC STERILIZER

For Efficient Sterilization



- With Automatic Heat Control and Cut-out.
- Seamless Reinforced Boiler.
- Strong lifting device for tray —heat insulated handles.
- In FIVE SIZES from 9" x 5" x 3" up to 20" x 10" x 7".

SES

SURGICAL EQUIPMENT SUPPLIES LTD
WESTFIELDS ROAD, LONDON, W.3
Name of Local Dealers on request

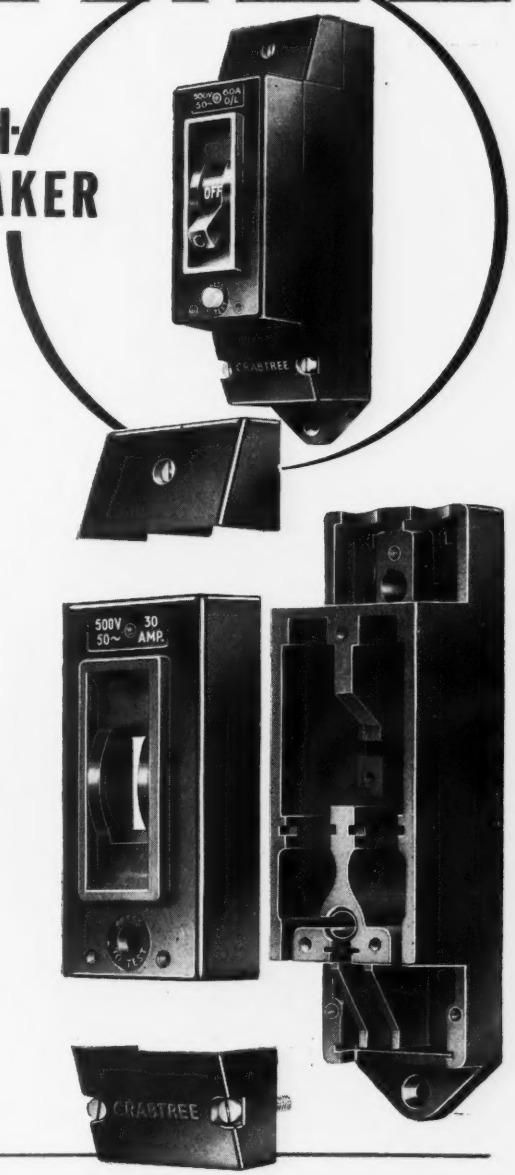
STURDY SHOCKPROOF CASE

CRABTREE

The TYPE E-60 EARTH-LEAKAGE CIRCUIT BREAKER

The sturdy case of the Crabtree Type E-60 earth-leakage circuit breaker is moulded with exacting care from tough 'Jacelite' insulating material. As will be seen from the exploded view at right, the phase barriers are an integral part of the base moulding which is also arranged to separate the wiring chambers from the mechanism. The assembled unit presents a tight-fitting case designed successfully to prevent dust and other foreign matter from reaching the operating chamber.

Further details of this interesting new circuit breaker will be found in Crabtree Publication No. 1179, copies of which are available on request.



NEW *AND BETTER* EARTH-LEAKAGE PROTECTION BY CRABTREE

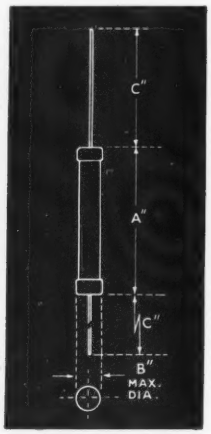
"Crabtree" (Registered)

C.758/137 Advt. of J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall, Staffs.

PAINTON

By Appointment to the Professional Engineer

HIGH STABILITY CARBON RESISTORS



ELECTRICAL CHARACTERISTICS

The electrical characteristic of a High Stability Carbon Resistor depends upon the physical size of the units and upon the ohmic value. All the data given below relates to the Type 73 Resistor. To obtain the equivalent ohmic values to which the information is applicable in the other four sizes of Resistor the following factors should be applied :

Type 72 x ½ Type 74 x 2 Type 75 x 4 Type 76 x 8

FULL LOAD STABILITY

Up to 100 K.ohms the resistance change at full load with an ambient temperature of 70°C. is less than 0·75% (average 0·25%) after 1,000 hours operation. At 1 Megohm the change is less than 1% (average 0·75%).

N.B. On D.C. loading the maximum voltages stated in RCL 112 should be observed.

AGEING AND SHELF DRIFT.

Up to 100 K.ohms the average change is 0·25% in 12 months (never greater than 0·75%). For 1 Megohm resistors the average change is 0·6% in 12 months (never greater than 1·25%).

CLIMATIC

Exposure to the two cycles of H.I. humidity as laid down in RCS 112 shows a change of less than 0·7% (average 0·4%) up to 100 K.ohms. At 1 Megohm the change is less than 1% (average 0·7%).

TROPICAL EXPOSURE

Eighty-four days exposure to the standard 25°C./35°C. 100% humidity cycling shows a change of less than 1% (average 0·5%) up to 100 K.ohms. At 1 Megohm the change is less than 2% (average 1·6%).

TEMPERATURE COEFFICIENT

The temperature coefficient is less than 0·04%/°C. up to 100 K.ohms. At 1 Megohm the coefficient is approximately 0·055%/°C.

NOISE

Noise which is generated in a resistor, as the result of a direct voltage applied across it, varies according to the ohmic value of the resistor, the noise decreasing as the ohmic value increases. The noise is also influenced by factors such as the size of the resistor.

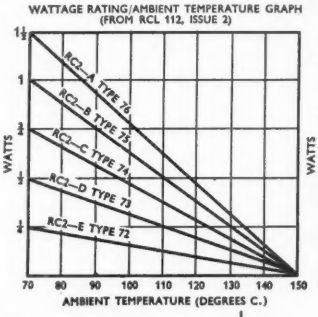
For noise which falls within frequency range of 0 to 10 Kc./sec., the Painton high stability resistors have noise levels which are between 0·05 and 0·4 microvolts of noise per applied direct volt, when the resistor is dissipating power at its maximum wattage rating.

VOLTAGE COEFFICIENT

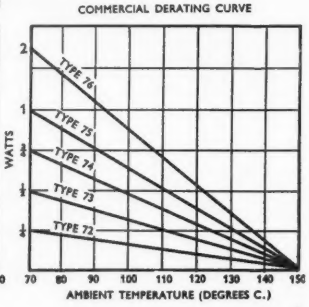
Not exceeding 0·002% per volt D.C.

DERATING FOR AMBIENT TEMPERATURES EXCEEDING 70°C.

WATTAGE RATING/AMBIENT TEMPERATURE GRAPH (FROM RCL 112, ISSUE 2)



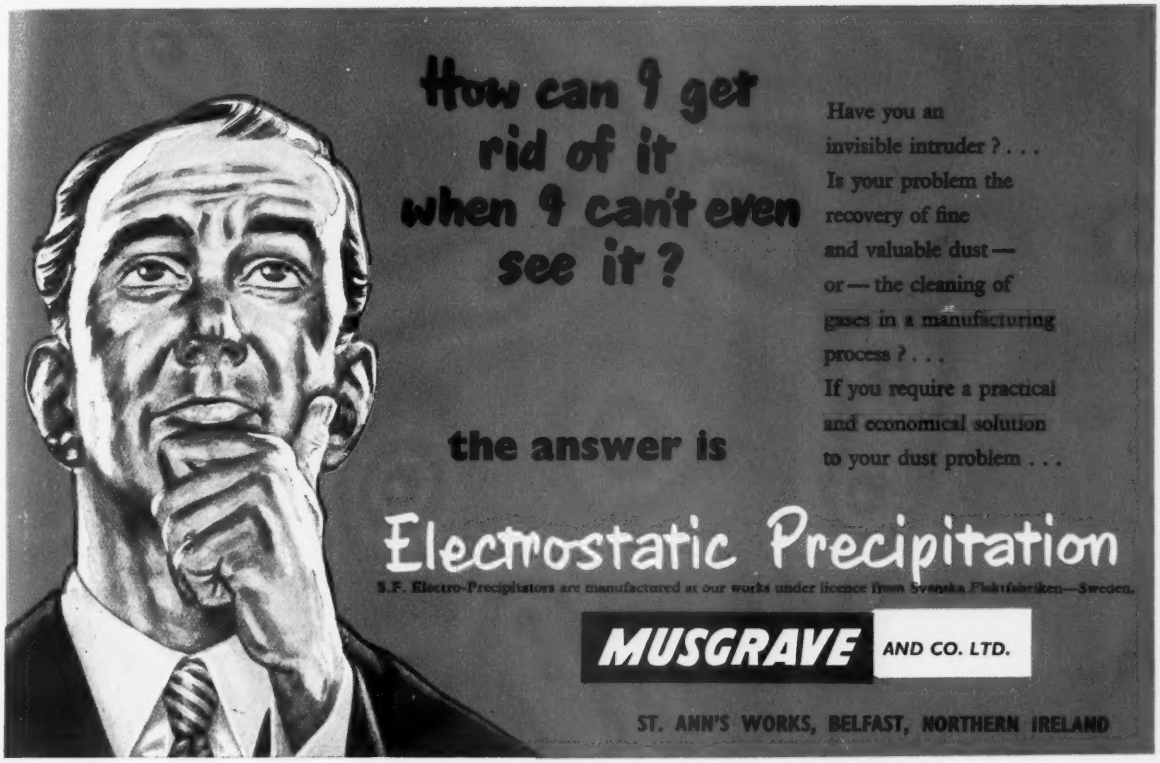
COMMERCIAL DERATING CURVE



TYPE	RESISTANCE RANGE (ohms)	VALUES OUTSIDE THIS RANGE MAY BE QUOTED FOR SEPARATELY.	
72	±1% 4—700K	±2% 4—1·0M	±5% 4—2·5M
73	±1% 4—1·0M	±2% 4—2·0M	±5% 4—5·0M
74	±1% 20—2·0M	±2% 20—4·0M	±5% 20—10·0M
75	±1% 20—3·0M	±2% 20—5·0M	±5% 20—10·0M
76	±1% 20—5·5M	±2% 20—9·0M	±5% 20—50·0M

TYPE		72	73	74	75	76
Normal Commercial Rating 70°C—watts		¼	½	¾	1	2
R.C.S.C. style		RC2-E	RC2-D	RC2-C	RC2-B	RC2-A
R.C.S.C. Rating at 70°C—watts		¼	½	¾	1	1½
R.C.S.C. Rating at 100°C—watts		⅛	¼	½	¾	1
DIMENSIONS IN INCHES	A	¼	11/32	1 3/32	1 3/8	2 1/32
	B	5/64	5/64	5/64	11/64	11/64
	C	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8

PAINTON
Northampton England


How can I get rid of it when I can't even see it?
Have you an invisible intruder? . . . Is your problem the recovery of fine and valuable dust — or — the cleaning of gases in a manufacturing process? . . . If you require a practical and economical solution to your dust problem . . .
the answer is
Electrostatic Precipitation
S.F. Electro-Precipitators are manufactured at our works under licence from Svenska Flaktfabriken—Sweden.
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There's a time and place to discuss even GGL service and quality, but when a man discovers it for the first time he tends to let his enthusiasm run away with him. Older customers simply accept it as one of the good things in life, and wonder how they ever managed without GGL.

CAPSTAN AND AUTOMATIC WORK AND SHEET METAL PRESSINGS IN ANY METAL, ANY FINISH, ANY QUANTITY

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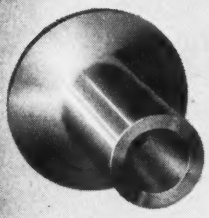
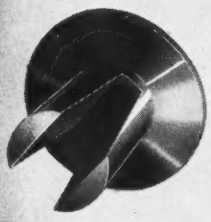
BIFURCATED AND TUBULAR

RIVETS

In all Metals & Finishes





S. & D. RIVET Co.
(PROP. STEELS AND BUSKS LTD.)

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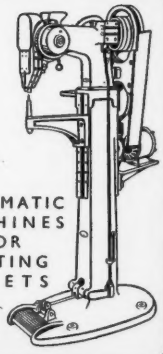


AUTOMATIC MACHINES FOR SETTING RIVETS

A/52

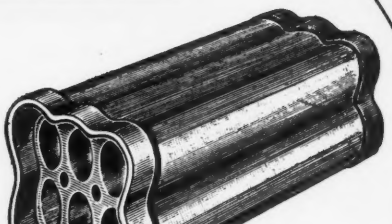
ORIGINAL MANUFACTURERS OF

Self-aligning

SALT-GLAZED STONEWARE MULTIPLE and SINGLE WAY with SELF-ALIGNING JOINTS

also

Rectangular Troughing and Glazed Bridge Insulators for Underground Electrical Cables



Conduits

PROMPT DELIVERY

ALBION CLAY CO. LTD.

ALBION WORKS, WOODVILLE, Nr. BURTON-ON-TRENT
Telephone: Swadlincote 7061, 7062, 7063 Telegrams: "Albion, Phone, Woodville"

STEATITE *Beads*

PERFECT INSULATION AND RELIABILITY

No porosity. Interlocking and shaped to ensure no kinks in bare wire insulation. High mechanical strength, eliminating breakage during assembly. High electrical values. Capable of withstanding very high temperature and thermal shock.

LOW COST

DELIVERY EX-STOCK

Useful Data:–
PRICE LIST and NEW CATALOGUE, giving full details of many types, sent at your request.

STEATITE INSULATIONS LIMITED
25 Somerset Road, Edgbaston, BIRMINGHAM *Telephone: Edgbaston 5381/2*

CRATER

PHONE
WOKING 4733

SWITCH SPECIALISTS

THE "CEELITE" NEON INDICATING CORD SWITCH. *It* **glows** *when switched on.*

Designed to latest B.S. Specification mainly for electric blankets, the switch is fitted with solid silver contacts and is double-pole operation.
The neon tube is housed in the slide action knob and shows a light drop of only approximately 2% after 10,000 hours' continuous use. The switch unit can be supplied without the shell for panel mounting.
Simple Cord Grip withstands a strain of over 35 lbs. Does not clamp the cable under no-strain conditions. Grips only when cable is pulled.

Tested by the E.D.A. Testing House and found to conform to the relevant clauses of B.S.2612.

SWITCHES

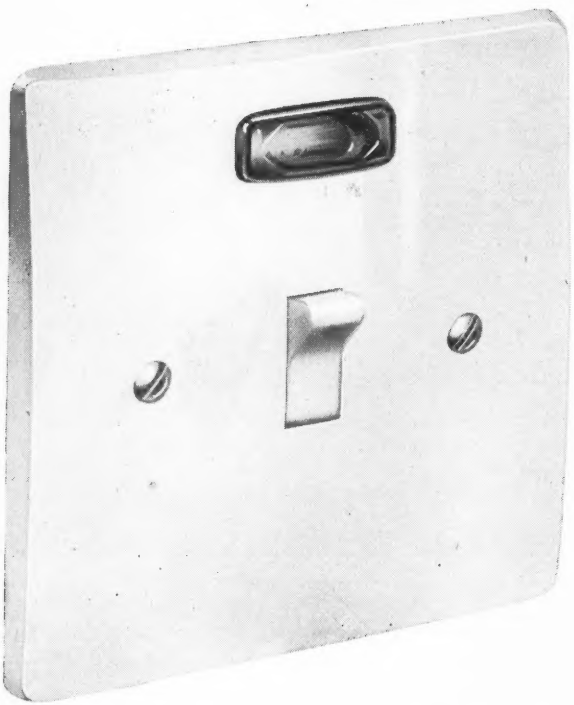
AGENTS WANTED IN CERTAIN OVERSEAS TERRITORIES

CRATER PRODUCTS LTD • WOKING • SURREY

MK 139
DHB

20 Amp. Switches

. . . now in flush and surface patterns



HERE is a *complete* new range of 20 ampere switches consisting of flush and surface patterns with or without pilot-lamps. The flush units have insulated plates moulded in brown or ivory, or brass plates finished BMA or matt chrome. The surface units are either all-insulated moulded in brown or ivory, or metalclad with steel box and cover plate finished aluminium stove enamel. The new switches are particularly suitable for water heater control, and any pattern can be supplied marked "WATER HEATER". Special features of the range are compactness and neat appearance. Ease of fixing and wiring has been carefully studied. The surface insulated patterns have self-contained mounting blocks and are ready to fix straight to the wall. All patterns have good earthing facilities. Write to-day for leaflet 243 which describes these attractive new switches in full.

MK . . . the mark of leadership

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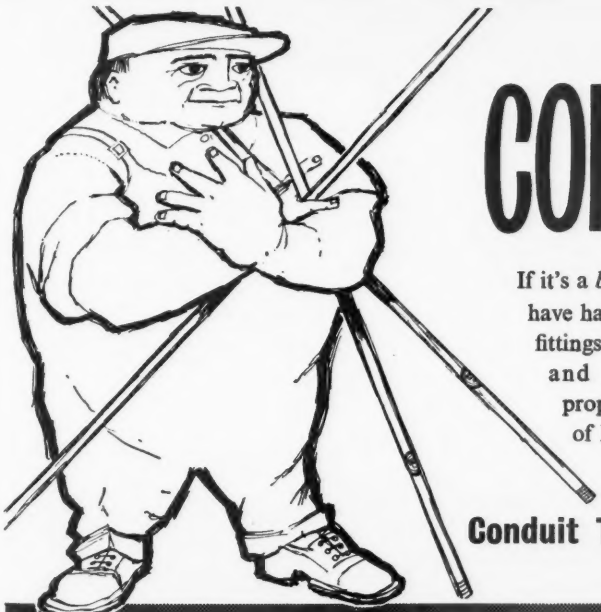
LEY'S

'Black Heart' Malleable

LEY'S MALLEABLE CASTINGS CO. LTD., DERBY

Telephone: DERBY 45671

Strength
Ductility



CONDUIT TUBES

If it's a *big* job, you can be pretty sure that METALLIC have had something to do with it. Their conduit and fittings are chosen repeatedly by electrical engineers and contractors who know the long-lasting properties of METALLIC tubes, and the reliability of METALLIC fittings.

Conduit Tube and Fittings by METALLIC

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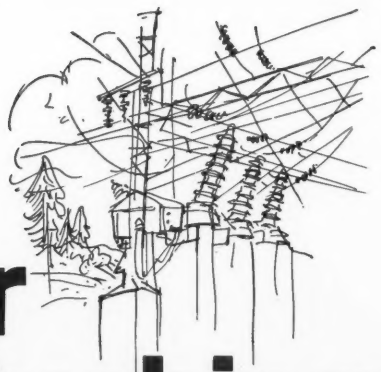
THE METALLIC SEAMLESS TUBE CO., LTD., LUDGATE HILL, BIRMINGHAM 3

AND AT LONDON, NEWCASTLE-ON-TYNE, LEEDS, SWANSEA & GLASGOW



Condenser Bushings

for any use and service voltages up to 400 000 V. Micafil bushings of standard or special design are famous all over the world for their complete reliability.

All problems of High Voltage Insulation

have been for years the special concern of our engineers and chemists. The development of insulating materials such as Superresocel resulted in design and building of still better insulators.
Bring your problem to Micafil—our services will find the adequate solution.

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MICAFIL

ELECTRICAL INSULATION CONDENSER BUSHINGS NEPOLIN CAPACITORS
HIGH-VOLTAGE TESTING EQUIPMENT COIL WINDING MACHINES VACUUM PUMPS

J3370E

Electrical signs, fittings and equipment, machinery, lifts, heating and ventilating fixtures, cinema seats, harbour installations etc.

SECURED

with expansion units using

STANDARD BOLTS and SET SCREWS

STUDBOLTS **PHILPLUG** **ANCHORBOLTS**

Expansion Units can be used with standard bolts or set screws. Any length of standard bolt can be drawn from stock to suit the job in hand or immediate supplies obtained locally or direct from us without delay. No special stock of bolts or set screws need be carried.

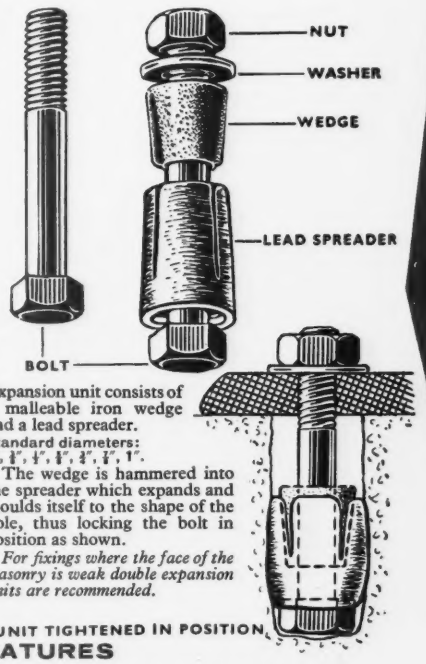
Expansion unit consists of collar, lead spreader and threaded malleable iron wedge.

Standard diameters: ¼", ⅜", ½", ⅝", ¾"

When the set screw is tightened, the threaded wedge is drawn into the spreader which expands and moulds itself to the shape of the hole thus locking the unit in position as shown.

It is recommended that, where the face of the masonry is weak, additional collars be used.

UNIT TIGHTENED IN POSITION



Expansion unit consists of a malleable iron wedge and a lead spreader.

Standard diameters: ½", ⅝", ¾", ⅞", 1", 1¼", 1½".

The wedge is hammered into the spreader which expands and moulds itself to the shape of the hole, thus locking the bolt in position as shown.

For fixings where the face of the masonry is weak double expansion units are recommended.

UNIT TIGHTENED IN POSITION

SPECIAL FEATURES

★ Use of Standard Bolts or Set Screws with Philplug Expansion Units lowers costs and reduces stocks.
★ Non-corrosive lead anchorage which absorbs vibration.
★ The unit will fit both regular and irregular shaped holes.
★ Studbolts are ideal for fixings in shallow concrete and brickwork.
★ Rust proof bolts and nuts can be used.
★ No grouting—No waiting.
★ Fixings to any depth—Increases in bolt projections. Easily obtained by varying lengths of bolts or set screws.
★ Standard tools are supplied for all sizes of bolts (Percussion—Rotary—or hand tools).

Write or telephone for PHILPLUG Bolt Fixing Data Sheet and details of complete range of PHILPLUG products. Our Technical Representatives are available to solve any fixing problem.

PHILPLUG PRODUCTS LIMITED

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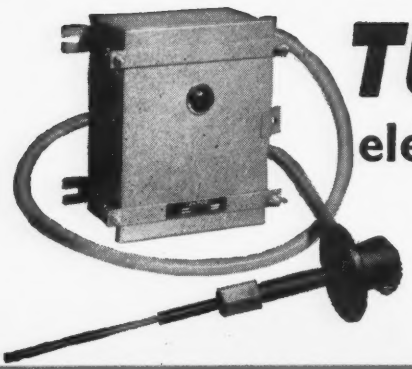
MISTER PHILPLUG

Reg'd Trade Mark



TEKTOR Regd. (weatherproof model)

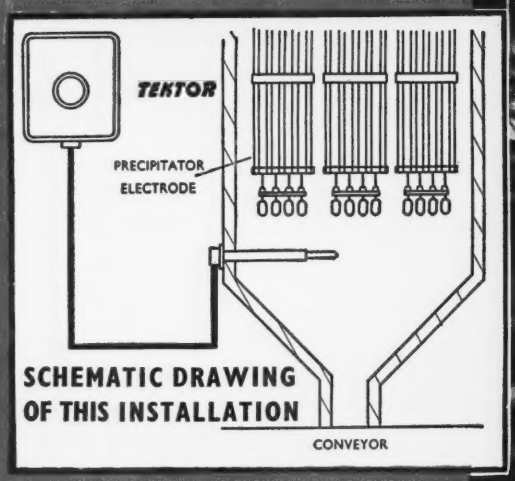
electronically prevents breakdown of dust control at Fleetwood Central Electricity Authority

To prevent heaped flue dust causing short-circuits by touching electrodes in a dust precipitator installation, the C.E.A. have installed Tektor J's to give warning of high level in the dust collecting hoppers.

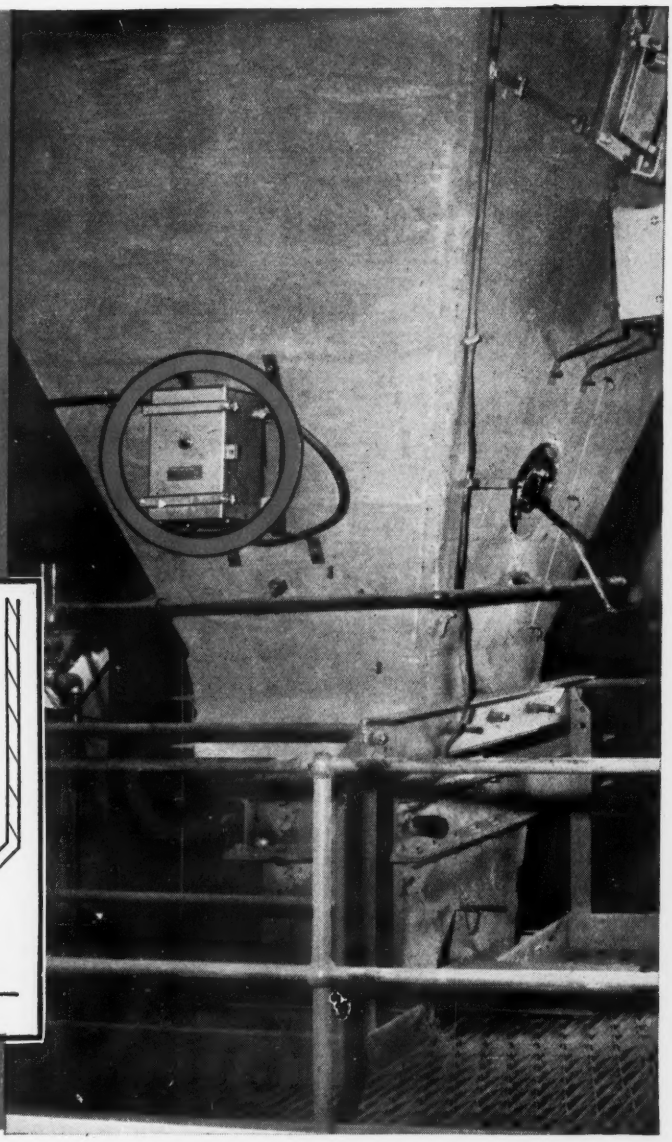
The Fielden Tektor J is a simple, inexpensive (approx. £25 per unit) reliable and robust level alarm or controller. It can be applied to practically all liquids or free-flowing solids, such as coal, coke, oil, sand, flour, stone, water, lime, etc., regardless of conductivity, insulating value, density, corrosive properties, or various process conditions. It maintains level at a desired point in any container irrespective of shape, size or construction. Flameproof models and weatherproof models available to meet every application in industry.

Full details in leaflet No. 203/ER.

The Tektor is protected by British Patent Nos. 697253, 645732 and foreign equivalents.



SCHEMATIC DRAWING OF THIS INSTALLATION



Write for details of TELSTOR electronic continuous volume indicator. Leaflet No. 223/ER.

FIELDEN ELECTRONICS LTD. · WYTHENSHAWE · MANCHESTER · ENGLAND
Telephone: Wythenshawe 3251 (4 lines) · Telegrams: Humidity, Manchester
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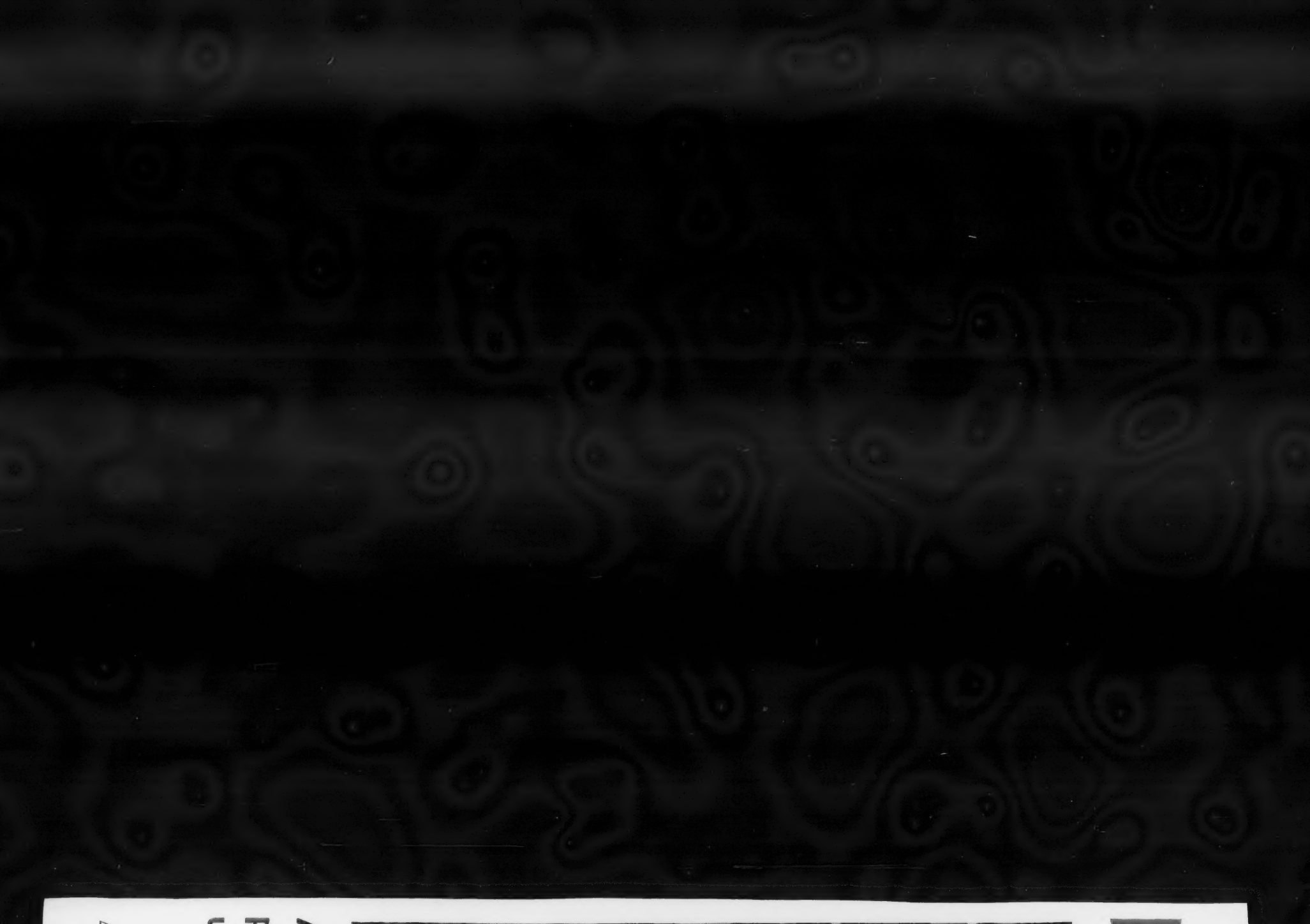
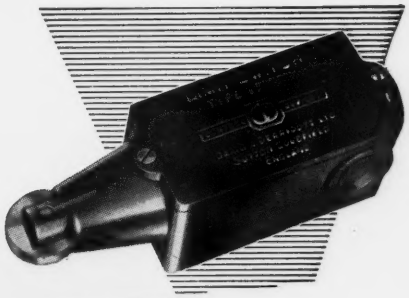
Fielden AUTOMATION





LIMIT SWITCHES

Compactness & Efficiency . . .

Send for our folder giving full details of dimensions and prices.

Type "V" Limit Switches are especially small and robust and fitted with silver butt type contacts, available with roller or plain plunger or dust and drip proof, in various switching sequences.

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ROYAL WORKS, SUTTON COLDFIELD, Nr. Birmingham
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As reliable as "BIG BEN"

THE . . .

"*Westminster*"

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ELECTRICALLY HEATED BLANKET
Waterproof Jointless Double Insulated Element
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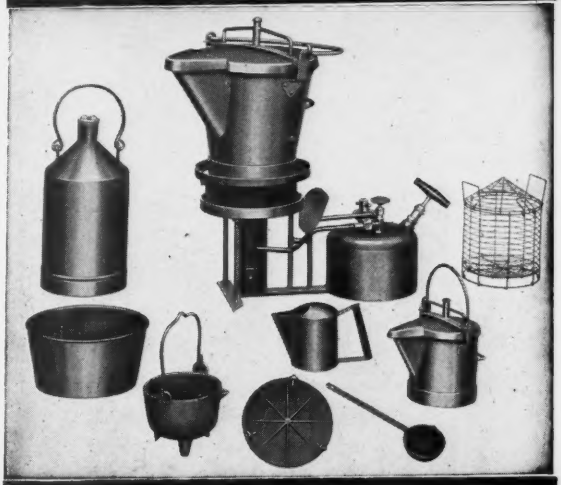

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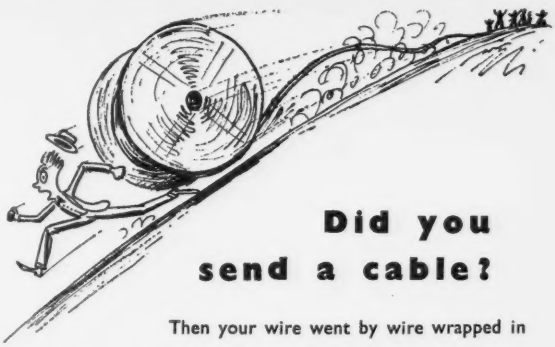

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Then your wire went by wire wrapped in paper — probably paper made by Watsons of Linwood. If you cabled us about specialised applications of paper for insulating problems, you came to the right people — we are experts on this sort of work. In fact anybody who is wrestling with an insulating problem is well advised to wire, write or phone us. We make specialised papers for the electrical industry, and our technical advisory service is ready to help you.

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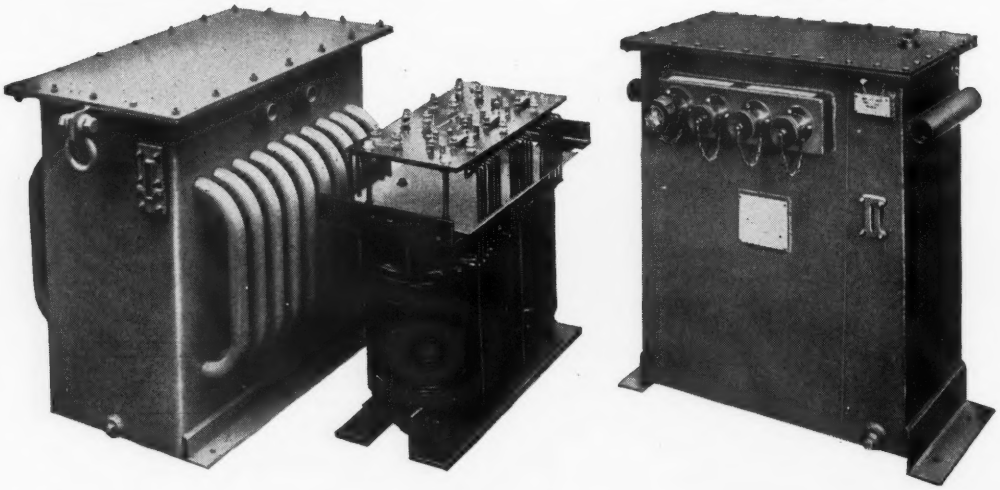

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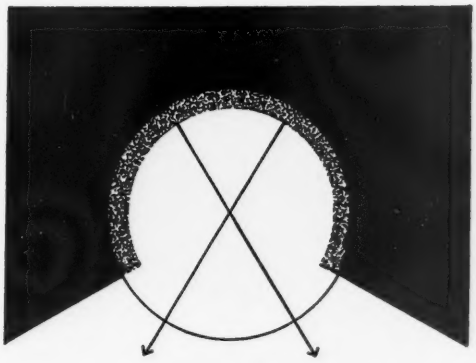

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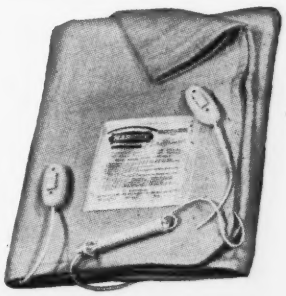

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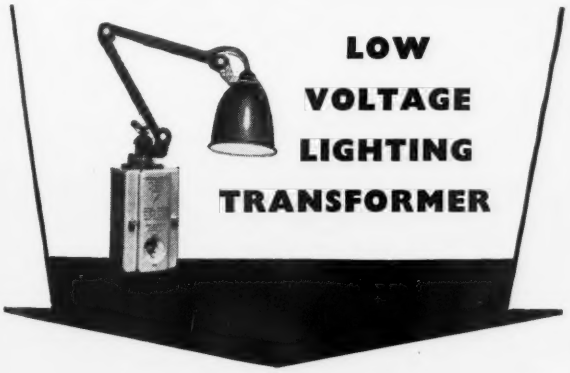

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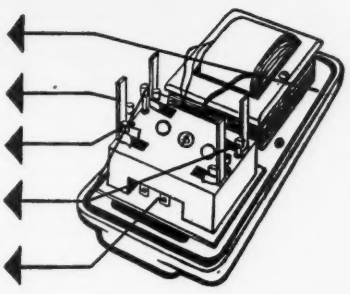

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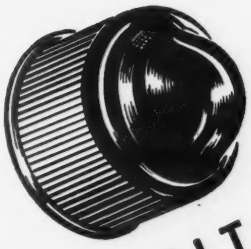

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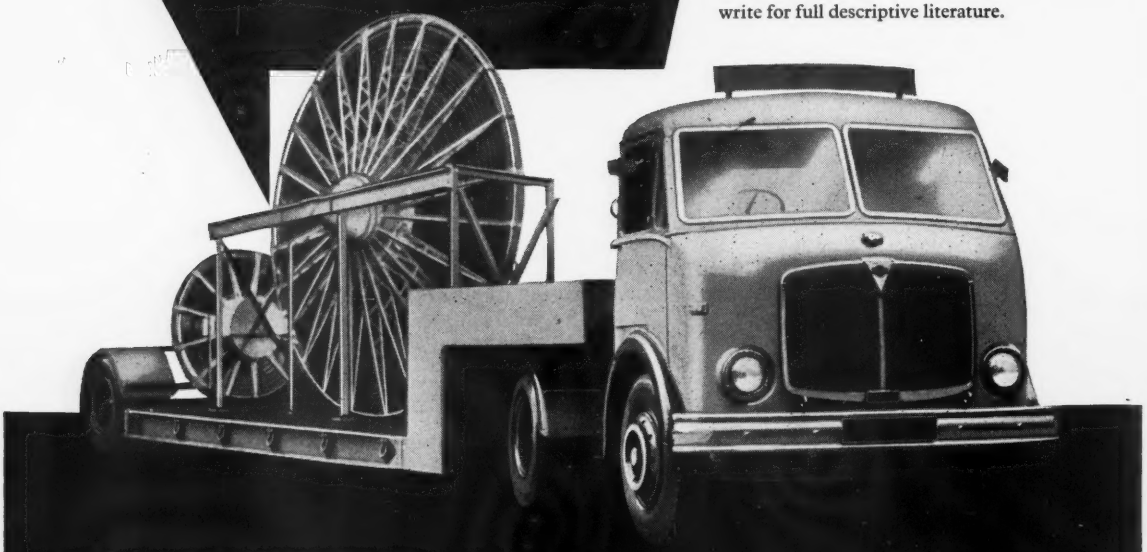

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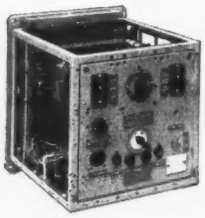

Illustration shows typical Control Unit manufactured to Customers' Specification.

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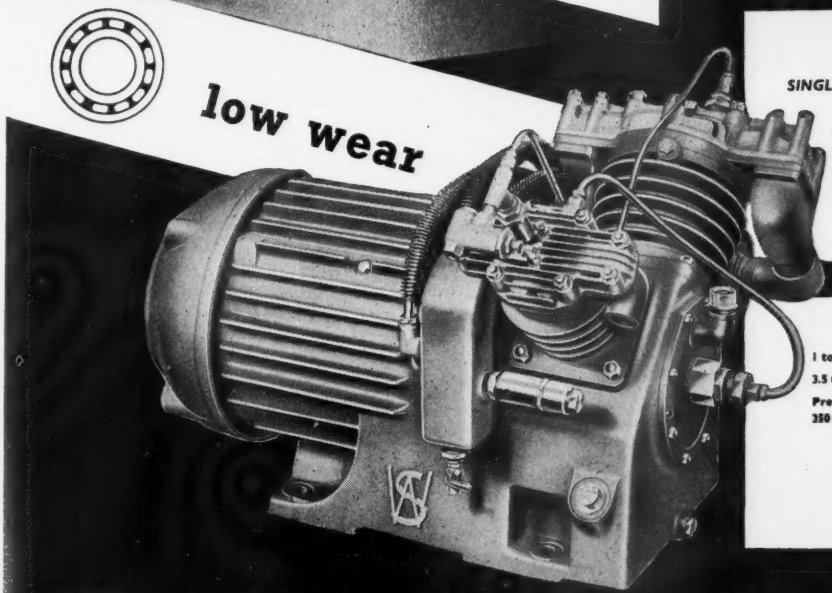

SINGLE-STAGE
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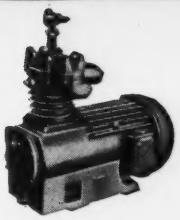
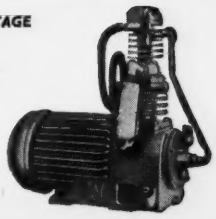
4.5 to 55.8 C.F.M.
Pressures up to 175 P.S.I.



TWO-STAGE
1 to 10 B.H.P.
3.5 to 36.7 C.F.M.
Pressures up to 350 P.S.I.



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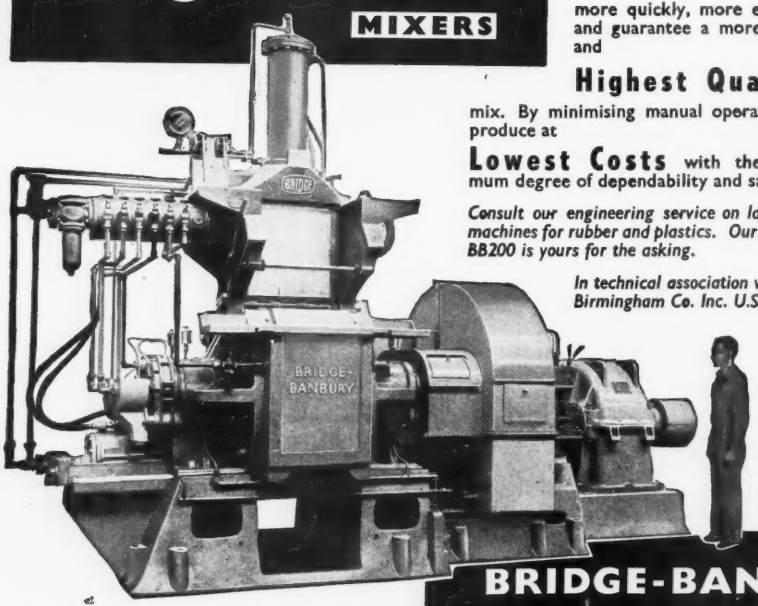

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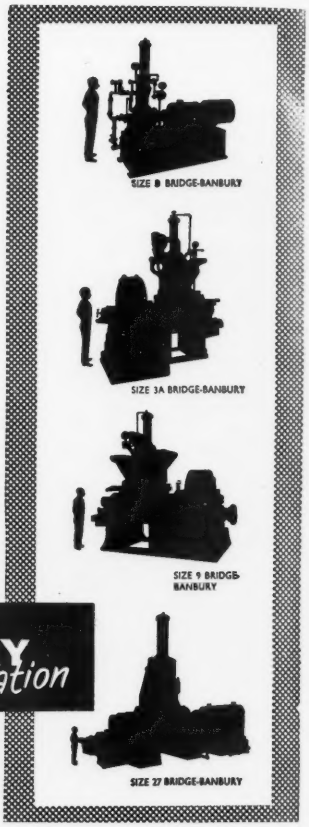

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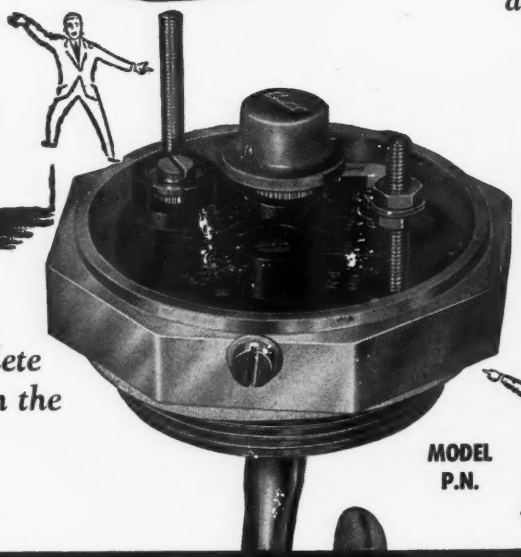

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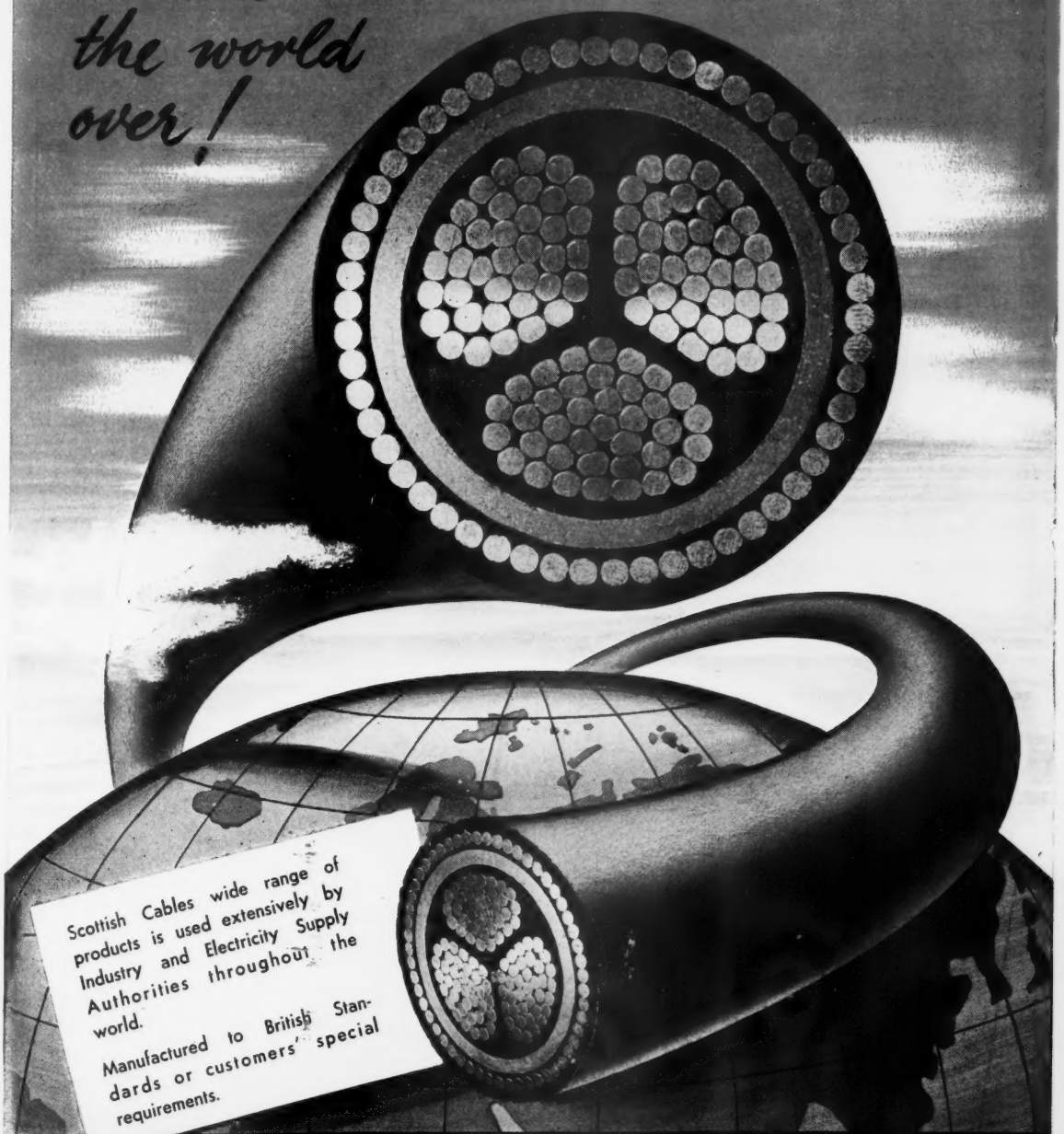

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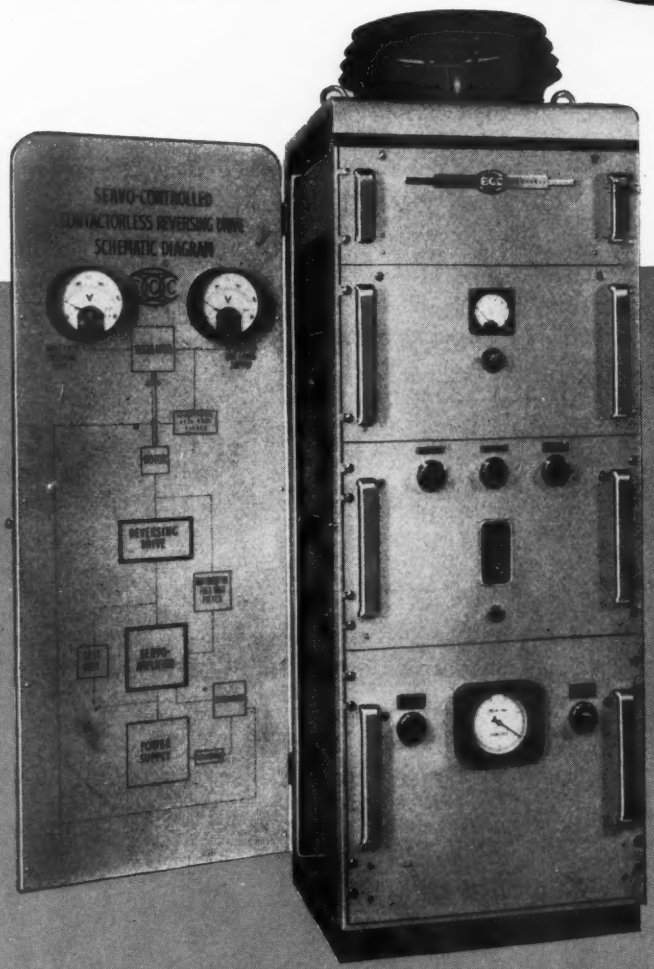

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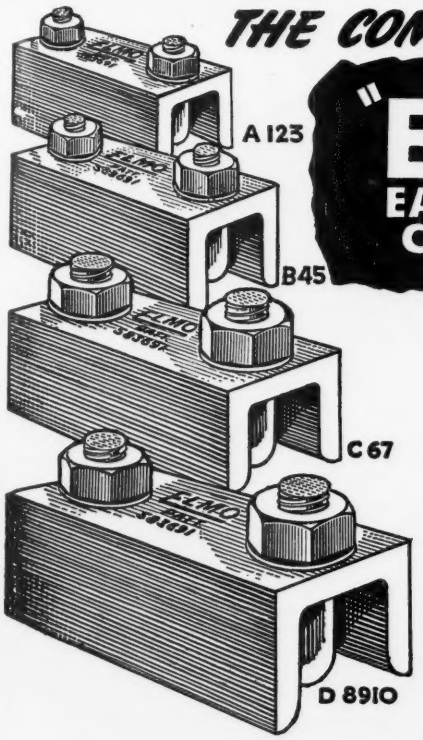

	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
i.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2¼" to 3½"

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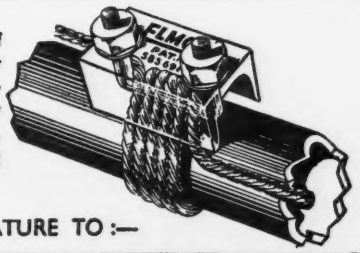

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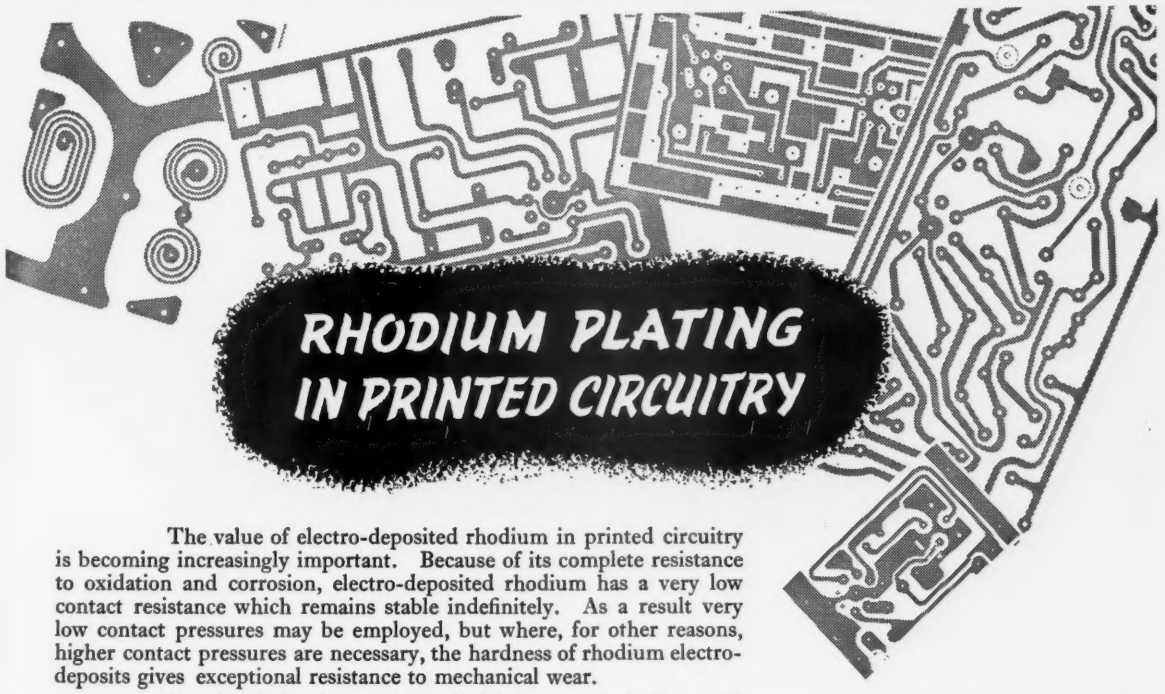

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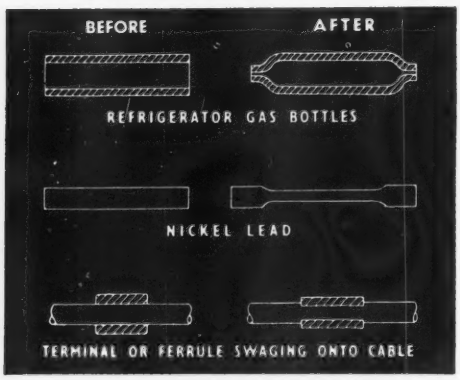

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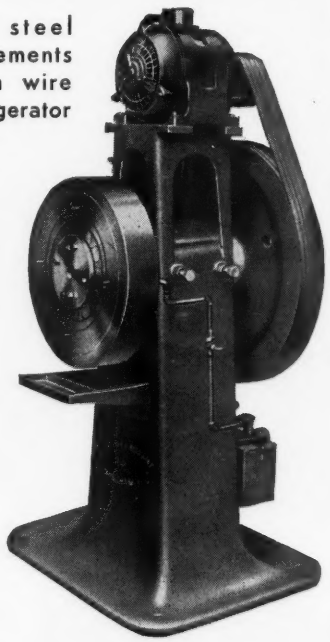

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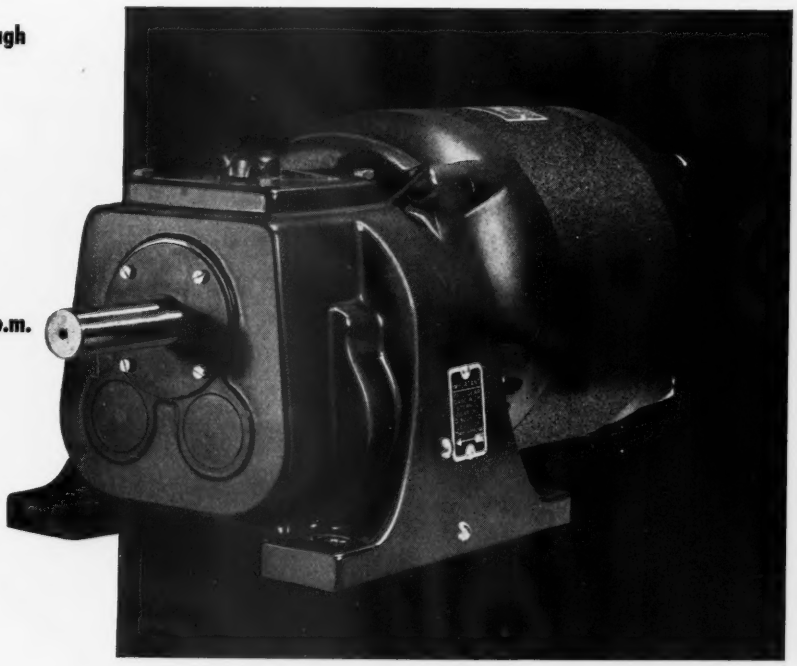

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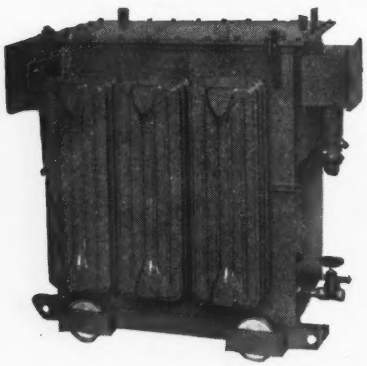

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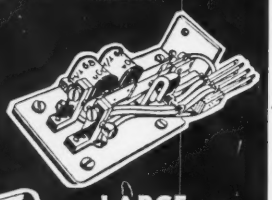
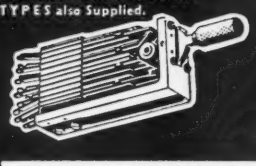


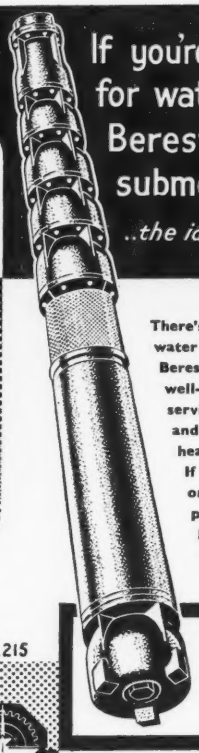


LARGE STOCKS OF KEYSWITCHES

THE KEYSWITCH CO.
ALL POST OFFICE EQUIPMENT
Enquiries to Sales Manager
126 KENSAL ROAD, LONDON, W.10
Telephone: LAD. 0666, 4640 Grams: "Fonequipt". London, W.10
Contractors to Home & Overseas Governments & H.M. Crown Agents

If you're in a hole for water-install a Beresford submersible pump...

..the ideal borehole pump



There's no better means of raising water from a well or borehole. The Beresford Submersible Pump is a sound, well-made pump, capable of long service, requiring little or no attention and it needs no pumphouse, cannot be heard and is installed out of harm's way. If you want to raise water—for a house or town—do it with a submersible pump—but remember that the Beresford is best in the long run. May we send you a copy of leaflet PF.310?

BN.215

BERESFORD submersible PUMPS

GANERCROFT GROUP

James Beresford & Son Limited
Kitts Green, Birmingham 33. Telephone : STEchford 3081
And at London, Glasgow, Manchester, Leeds, etc.

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YOUR GUARANTEE OF FIRST CLASS LIGHTING EQUIPMENT

Harris & Sheldon (Electrical) Ltd.

COMPLETE LIGHTING SPECIALISTS & MANUFACTURERS OF LIGHTING FITTINGS & CONTROL GEAR

HEAD OFFICE AND SHOWROOMS — RYDER STREET, BIRMINGHAM, 4

London Phone : GERRARD 0869/0860 — Nottingham Phone : NOTTINGHAM 53630 — Birmingham Phone : CENTRAL 7101

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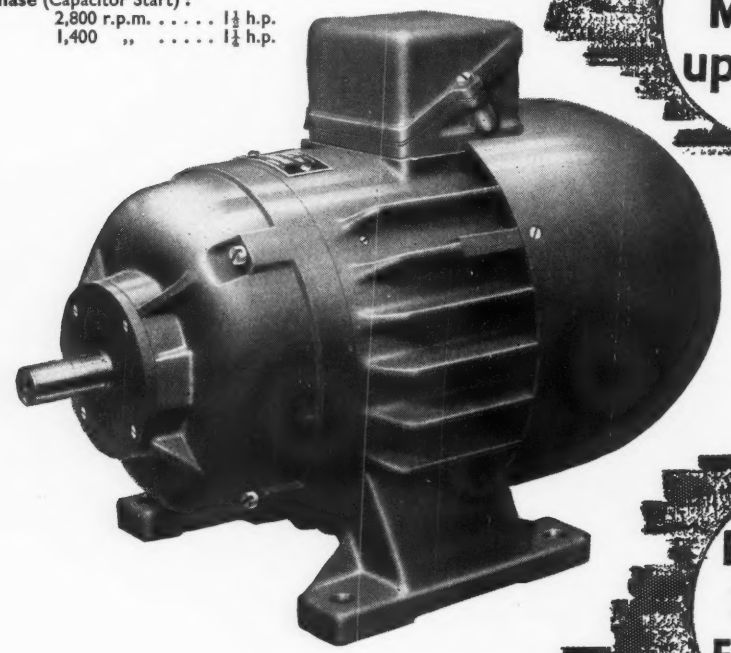
Precision Power Motors

CROYDON totally enclosed externally cooled Motors are now available for the following ratings :—

3-phase : 2,800 r.p.m. . . . . 2½ h.p.
1,400 ,, ... 2 h.p.

1-phase (Capacitor Start) :
2,800 r.p.m. . . . . 1½ h.p.
1,400 ,, ... 1¼ h.p.

Range of Motors up to 2½ h.p.



Backed by 33 years Experience

If you have a Motor Problem Consult

Also
F.H.P. Motors for--

Air Conditioning Equipment, Business Machines, Chemical Plant, Control Devices, Electronic Equipment, High Frequency Blowers and Fans, Radar Aerial Drives, Servo Controls and many other applications.
CROYDON manufacture complete Alternator Sets (including H/F Inductor Alternators), Brake Motors, D.C. Centrifugal Blowers, Generator Sets, Geared Units, Polarised Synchronous Units, Hysteresis Motors, Governed Machines, Rotary Converters, Torque Motors—in fact one of the most comprehensive ranges of 'SPECIAL' F.H.P. Motors in the United Kingdom.

CROYDON

THE CROYDON ENGINEERING COMPANY LIMITED
COMMERCE WAY, PURLEY WAY, CROYDON, SURREY

Telephone : CROYDON 4125-6-7-8

the ***NEW***

"SANDALINE"

SURFACE MOUNTING FUSEBOARDS

★ **EASY INSTALLATION**

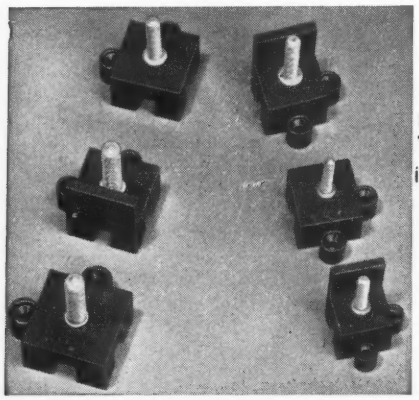
★ **INTERCHANGEABLE H.R.C. OR REWIREABLE FUSES**

Send for leaflet 156/57

WM. SANDERS & CO. (WEDNESBURY) LTD.
WEDNESBURY · STAFFS

SANDERS
WEDNESBURY

*No longer **NEW** but accepted.*



Unit construction **TER-MATE** inter-locking terminal blocks

Patented

Repeating orders and C S A Approval confirm the adaptability of these terminals which are now available in stud sizes ranging from 4. B. A. to 5/16" moulded in bases 5/8" square to 1 1/4" with or without barriers.

Any shape, any number of ways, anywhere, all as an integral unit, ideal for panels etc.

Samples and literature on request:—

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NOEL WORKS : ELSON STREET : NEW BASFORD : NOTTINGHAM

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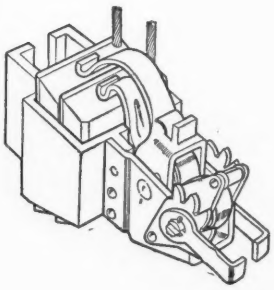
BRUSH HOLDERS



Features—

INDEPENDENT SPRINGS
SEPARATE ADJUSTMENT
'HOLD-OFF' FOR PRESSURE FINGERS
RADIAL OR TRAILING BRUSHES
SEVERAL FIXING METHODS

SYNTHETIC CARBON AND ENGINEERING CO. LTD.

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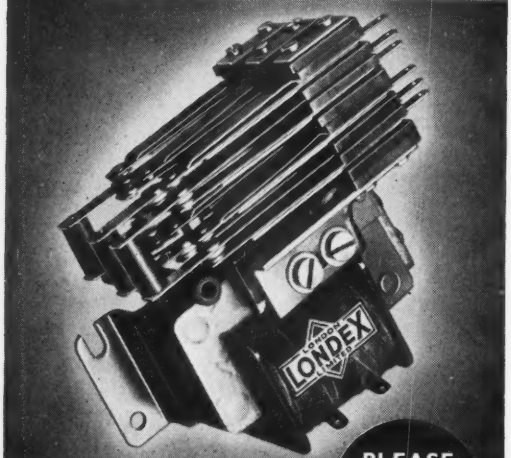
IN THOUSANDS OF VARIATIONS



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LONDEX LTD

ANERLEY WORKS · LONDON · SE20

Telephone: ★ SYD 6258

60 YEARS OF CABLEMAKING

Specialist Manufacturers of

FLEXIBLE CABLES & CORDS

to B.S.S., G.D.E.S., etc., specifications

TRADE MARK ESTD. 1885

Lighting, Power, Dynamo, Lifts, Welding and Trailing, V.I.R. and T.R.S., Asbestos and Flame-Resisting, Enamel, Silk, Cotton and Glass Insulated Wires, Bare Copper Braids, Non-Rubber Flexibles, Plaited Copper Braids and Cords, P.V.C.-Polythene, P.V.C.-Microphone, Screened, Armoured, etc.

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Contractors to the Admiralty, War Office and Air Ministry, etc.

Offices and Works: **ROAN WORKS, GREENWICH, S.E.10**

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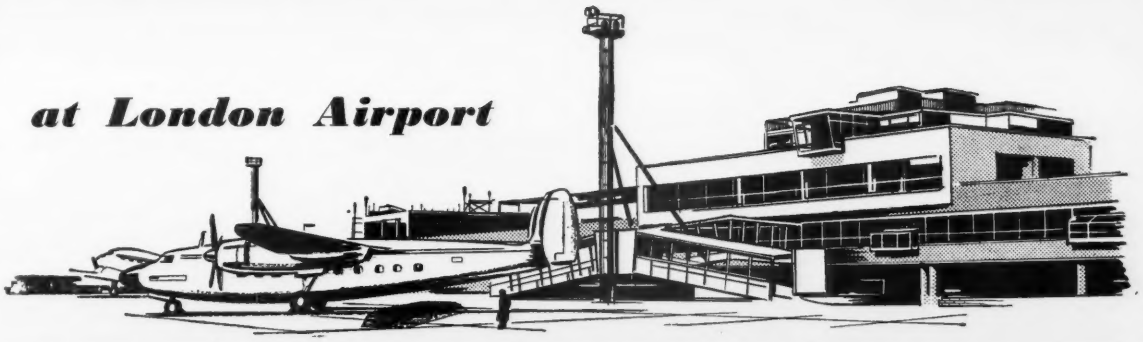

CORRUSTEEL

ARMOURED CABLE

by

wandleside of wandsworth

Illustration shows "CORRUSTEEL" Armoured Cable in the Main Feeder Trunking at London Airport's new building.
Electrical Contractors: The L.E.B. Contracting Section, Chelsea Manor Street, S.W.3.

"CORRUSTEEL" Armoured Cables as Control Cables are eminently suitable for use in Atomic Power Stations being fire-proof and watertight

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WANDLESIDE CABLE WORKS LTD. · 106 GARRATT LANE · WANDSWORTH · LONDON · S.W.18
Telephone: BATtersea 2273-4 Telegrams: "Wandleside, London" One of **FALKS** Group
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ELECTRIC BLANKETS HAVE *Extra Safety* BUILT IN

Only WARMABED electric blankets carry the British Standards kite mark on every model. Only WARMABED electric blankets are made from 100% pure wool and insulated with 12-ends Asbestos braid.

Every WARMABED electric blanket is fully guaranteed.

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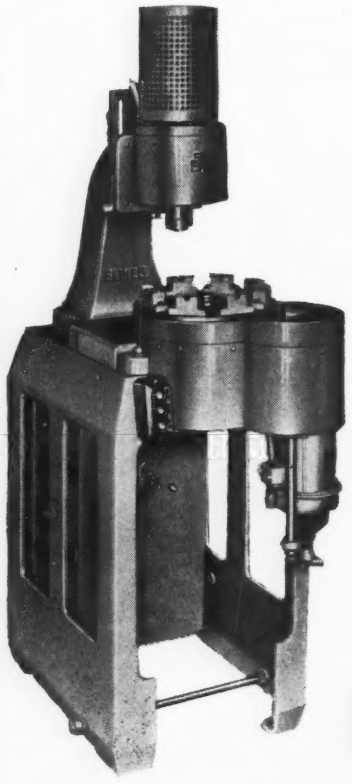

ELMEG *AUTOMATIC*

Electro-Magnetic PRESS

Consider these features ! !

- ★ Infinitely Variable Blow Force, rheostatically controlled, up to 2 tons.
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The ELMEG range of machines can be inspected under power at our Showrooms or on our

STAND No. 1 CENTRE ROW GALLERY NATIONAL HALL

ENGINEERING

MARINE WELDING & NUCLEAR ENERGY EXHIBITION

OLYMPIA · LONDON

29 AUG. - 12 SEPT. 1957

Other sizes available from ¼ to 9 tons.

Exclusive Distributors in the United Kingdom

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Aeroflex

ENERGY LIMITING

CARTRIDGE FUSES TO CLASS P

This new range of Aeroflex Fuses (AD and FC type) Category 440 AC5 Class P - is fully interchangeable with the former patterns and is now supplied in all listed Fluvent Switch and Fusegear. They offer refinements in performance, primarily due to the following factors:-

TECHNICAL DATA

Publication CF2 deals extensively with the subject and affords interesting data. A copy will be forwarded gladly to enquirers and students.

These characteristics are extensively detailed in this new publication, CF2, which reproduces actual oscillograms obtained during ASTA tests.

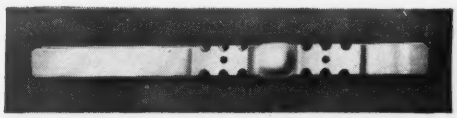
(1) The proved Breaking Capacity is raised from 33 to 46 K.A.

(2) The Energy Limiting is uniformly developed throughout the range.

(3) The fusing Factor is standardised at 1.25 throughout the range.

(4) The cartridge cases are ceramic instead of fibre.

(5) The end caps are fixed instead of being detachable as in the AF pattern, and re-wiring is normally carried out by returning blown cartridge fuse-links to the factory and not on site.



★ *The latest types of Aeroflex fuse element as employed in the AD and FC type Energy Limiting Fuses.*

Rewireability : Fuse Links are not discarded when blown —they can be returned for prompt replacement under our rewiring service scheme.

Parmiter Hope & Sugden Ltd

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

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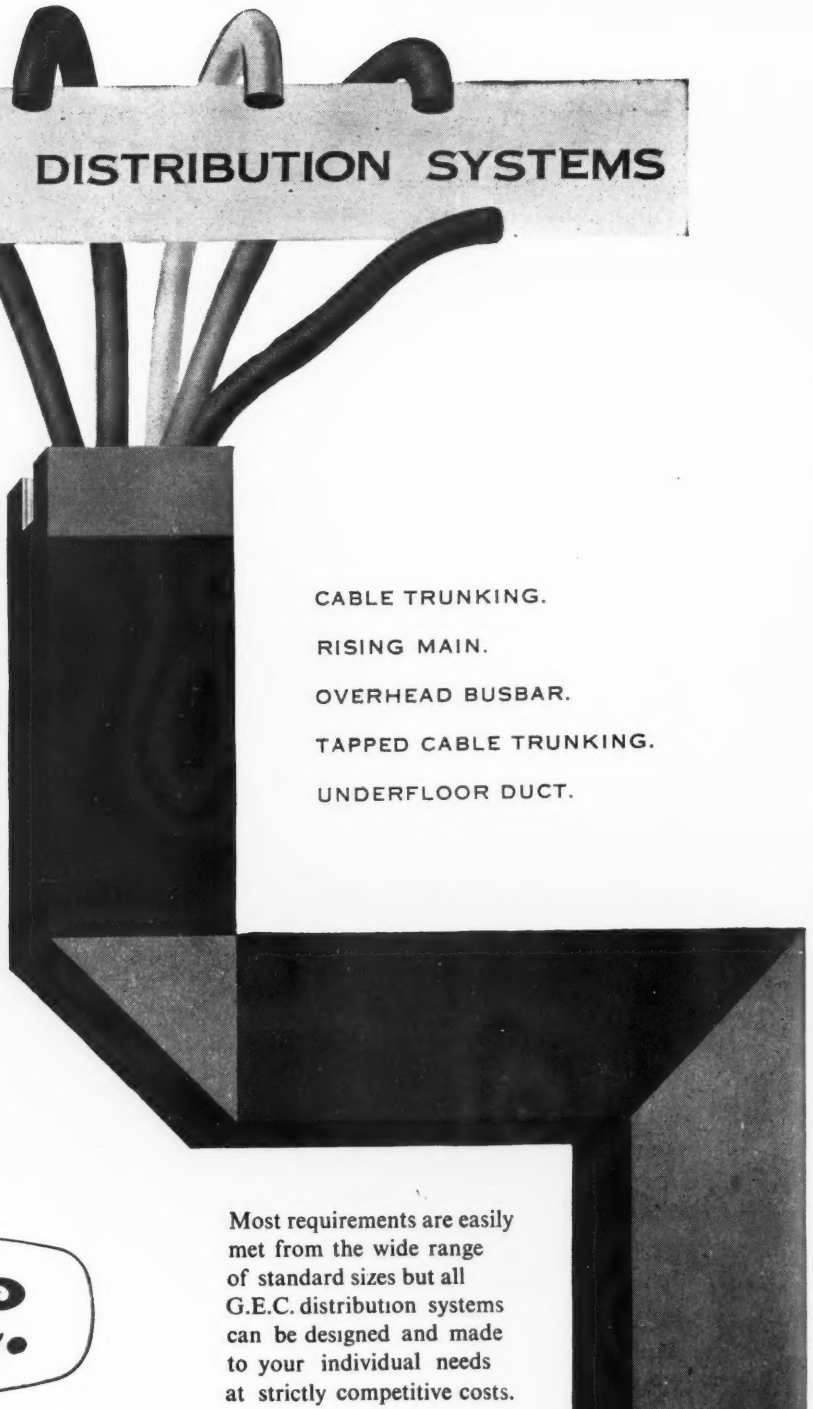
dm PH83

ELECTRICAL DISTRIBUTION SYSTEMS



CABLE TRUNKING.

RISING MAIN.

OVERHEAD BUSBAR.

TAPPED CABLE TRUNKING.

UNDERFLOOR DUCT.

G.E.C.

Most requirements are easily met from the wide range of standard sizes but all G.E.C. distribution systems can be designed and made to your individual needs at strictly competitive costs.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to First Post on Monday of the week of issue and should be addresssed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF FOLKESTONE

Street Lighting, Trunk Road A.20

Radnor Park Road, Pavilion Road, Black Bull Road, Canterbury Road (part), Hill Road and Dover Road (part)

TENDERS are invited for the provision of 87 Street Lighting Units consisting of columns, lanterns, lamps, auxiliary and control gear.

Specification and form of tender may be obtained on application to Mr. E. L. Allman, Municipal Offices, West Terrace, Folkestone, and deposit of two guineas with the Borough Treasurer at the same address. This sum will be refunded on receipt of a bona fide tender and return of all documents.

Tenders must be returned in the plain sealed envelopes provided to the undersigned not later than the 5th September, 1957.

General conditions of contract and the plan may be seen at the office of the Borough Engineer, to whom all enquiries must be addressed.

N. C. SCRAGG,
Town Clerk.

Municipal Offices,
West Terrace, Folkestone.
3rd August, 1957. 7053

FARNHAM URBAN DISTRICT COUNCIL

Street Lighting

TENDERS are invited for the supply and installation of 158 Group A and 516 Group B Lighting Points (partly on columns and partly on brackets). The Council reserve the right to separate the work of supply and erection into separate contracts should they think fit.

Form of tender, conditions of contract, specification and bills of quantities may be obtained from Geoffrey Poole, A.M.I.C.E., Engineer and Surveyor, Council Offices, South Street, Farnham, Surrey, on receipt of a deposit of £3 3s., which will be refunded after the submission of a bona fide tender and the return of all documents.

Tenders should be returned to the undersigned in the endorsed envelope provided not later than noon on Tuesday, 10th September, 1957.

The Council do not bind themselves to accept the lowest or any tender.

A. A. MINNS,
Clerk of the Council.

Council Offices,
South Street,
Farnham, Surrey. 7054

KINROSS COUNTY COUNCIL

Milnathort Special Lighting District

KINROSS County Council propose the installation of 33 Sodium Discharge Lamps on the part of Route A.90 in the above lighting district, and applications for schedules are invited from contractors.

The County Council reserve the right to draw from the applications received the names of the contractors from whom they will invite tender.

Applications to be lodged with the subscriber not later than 24th August, 1957.

D. A. R. CUTHBERT,
County Clerk, Kinross.
7097

YORKSHIRE ELECTRICITY BOARD

Supply of Cables

TENDERS are invited for the supply of the following classes of cables:—

(1) Paper Insulated Mains Cables, 1,100 and 11,000 volts.
(2) Paper Insulated Mains Cables, 22,000 volts.
(3) Paper Insulated Auxiliary Cables.
(4) Plastic Insulated Auxiliary and Service Cables.
(5) Rubber Insulated Auxiliary and Service Cables.
(6) Varnished Cambric Insulated Cables.

Conditions of contract, details of specifications and forms of tender can be obtained on application to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds.

No tender will be considered unless received in the official envelope provided, which shall not bear any mark or name indicating the sender.

The Board does not bind itself to accept the lowest or any tender.

E. K. RICHMOND,
Secretary. 7098

URBAN DISTRICT COUNCIL OF BASILDON

Public Lighting

TENDERS are invited for the supply of 930 Wood Pole Mounting Brackets and for 980 Group "B" Lanterns.

Tender documents to be obtained from the Engineer and Surveyor to the Council, and tenders to be returned to the undersigned by 12 noon on Monday, 2nd September, 1957.

The Council does not bind itself to accept the lowest or any tender.

A. HATT,
Clerk of the Council.

Council Offices,
High Street,
Billericay, Essex. 7137

SITUATIONS VACANT

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

MEXBOROUGH DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER.

Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound practical training and extensive experience in the operation, construction and design of H.V. and L.V. underground and overhead distribution systems, substation plant and ancillary equipment in urban and rural areas.

Salary N.J.B. Class F, Grade 7, £885/£15/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 23rd August, 1957.

No. 7 (Grimsby) Sub-Area

GRIMSBY DISTRICT (Louth)
THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should be of Higher National Certificate standard in electrical engineering, and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary N.J.B. Class F, Grade 9, £790/£15/£835 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 29th August, 1957.

THIRD ASSISTANT ENGINEER (Commercial).

Applicants should preferably have had a technical education up to Higher National Certificate standard in electrical engineering and have experience of industrial supplies. Some knowledge of street lighting would be an advantage.

Salary N.J.B. Class J, Grade 10, £885/£15/£930 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 23rd August, 1957.

No. 5 (Wakefield) Sub-Area

FOURTH ASSISTANT ENGINEER (Distribution Design).

Applicants must hold at least the Higher National Certificate in Electrical Engineering, and should have had some experience in the construction, operation and maintenance of distribution networks and in the planning of H.V. and L.V. overhead and underground distribution systems and the design of substations. Experience in the preparation of reports, load estimates and capital budgets is desirable.

Salary N.J.B. Class L, Grade 13, £835/£15/£880 per annum.

BARNSLEY DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER.

Applicants should have a sound practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering or equivalent qualifications.

Candidates must be prepared to reside in the District and undertake standby duties.

Salary N.J.B. Class G, Grade 9, £835/£15/£880 per annum.

CASTLEFORD DISTRICT
THIRD ASSISTANT DISTRICT ENGINEERS (2 posts).

Applicants should have had practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution network, substation plant and ancillary equipment.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering or equivalent qualifications.

Candidates must be prepared to reside in the District and undertake standby duties.

Salary N.J.B. Class F, Grade 9, £790/£15/£835 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 23rd August, 1957. 7099

CLASSIFIED ADVERTISEMENTS ARE PREPAID

***Situations Vacant** (continued)*

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Northmet Sub-Area

GENERAL ASSISTANT ENGINEER, Sub-Area Construction Department (Ref. 717). 99/57.R.

Candidates should have had a sound technical training to Higher National Certificate standard.

The successful applicant will be required to assist in the supervision of cable laying by direct and contract labour, and in jointing on all classes of cable up to and including 33 kV.

Salary, N.J.B. Class M, Grade 17 £685-£730) plus London allowance.

ENGINEERING DRAUGHTSMAN, SUB-AREA HEADQUARTERS (Ref. 730). 100/57.R.

The duties include layout of switchgear, transformers, and associated equipment for outdoor and indoor type substations up to 33 kV.

Salary, N.J.B. Schedule D. Grade 6 (£595-£715) plus London allowance.

For the above Sub-Area appointments, apply by letter to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area Eastern Electricity Board, Northmet House, Southgate, N.14, by 26th August, 1957.

3RD ASSISTANT ENGINEER, HORNSEY DISTRICT (Ref. 727). 101/57.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 9 £790-£835) plus London allowance.

Apply by letter to C. Bradley, M.I.E.E., District Manager, Eastern Electricity Board, The Broadway, Crouch End, N.8, by 26th August, 1957.

4TH ASSISTANT ENGINEERS.
(i) HERTFORD DISTRICT (Ref. 721). 102/57.R.
(ii) EDMONTON DISTRICT (Ref. 714). 103/57.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 11 (£685-£730) plus London allowance for (ii) only.

Apply by letter within 10 days to the appropriate District Manager as follows:—
(i) W. H. Hatton-Ward, Assoc.I.E.E., District Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts.
(ii) C. A. Baker, B.Sc.(Eng.) (Lond.), M.I.E.E., District Manager, Eastern Electricity Board, 305, Fore Street, Edmonton, N.9.

ST. ALBANS DISTRICT.
SALES REPRESENTATIVE (Ref. 700). 97/57.R.

Applications are invited for the appointment of Sales Representative in the Hatfield Service Centre of the St. Albans District.

The duties will be advising consumers on commercial matters associated with supply, tariffs and apparatus sales, in accordance with the N.J.C. Agreement. The successful candidate will be expected to assist with Service Centre work when required and to work the normal Service Centre hours.

Salary N.J.C.1. (£500-£600).

Apply by letter to F. J. Drake, Assoc.I.E.E., District Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, by 26th August, 1957.

Chilterns Sub-Area

4TH ASSISTANT ENGINEERS.
(i) AYLESBURY DISTRICT. 104/57.R.
(ii) WATFORD DISTRICT. 105/57.R.

Candidates for (i) should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Candidates for (ii) should have a sound technical training and be experienced in the construction, operation and maintenance of H.V. and L.V. underground systems including substations and switchgear. Knowledge of overhead circuits would be an advantage.

Salary N.J.B. Class F, Grade 11 (£685-£730) plus London allowance for (ii) only.

Apply by letter within 14 days, to the appropriate District Manager as follows:—
(i) F. Bent, M.I.E.E., A.M.I.Mech.E., District Manager, Eastern Electricity Board, Exchange Street, Aylesbury, Bucks.
(ii) The District Manager, Watford District, Eastern Electricity Board, The Parade, High Street, Watford.

Essex Sub-Area

HEADQUARTERS, BRENTWOOD.
4TH ASSISTANT ENGINEER (Planning and Development). 106/57.R.

Candidates should have had a good general and technical education and possess the Higher National Certificate or equivalent qualification.

The work includes the planning of schemes involving 33 kV mains and substations, 11 kV reinforcement, and large housing estates, and provides the opportunity to a keen engineer to obtain experience of large scale development in an expanding Sub-Area.

Salary N.J.B. Class L, Grade 13 (£835-£880) plus London allowance.

Apply by letter within 14 days to E. A. Cullen, M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, Nr. Brentwood, Essex.

NORTH ESSEX DISTRICT.
4TH ASSISTANT ENGINEER. 107/57.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations. Opportunity to obtain extensive rural experience is open to the successful candidate.

Salary N.J.B. Class F, Grade 11 (£685-£730).

Apply by letter within 14 days to J. C. Horrell, M.I.E.E., Manager, North Essex District, Eastern Electricity Board, Cressing Road, Braintree, Essex. 7118

NEW ZEALAND MINISTRY OF WORKS

Professional and Technical Staff

THE Ministry of Works, New Zealand, invites applications for the following vacancies on the Permanent Staff. Positions, qualifications desired and commencing salaries are as follows:

MECHANICAL ENGINEERING DIVISION.

5. MECHANICAL AND ELECTRICAL ENGINEERS.
Corporate Membership of the Institution of Mechanical or Electrical Engineers, London, whichever is appropriate. Commencing salaries £895-£1,465 per annum.

6. BUILDING SERVICES ENGINEERS.
Corporate Membership of the Institution of Mechanical Engineers or of the Institution of Heating and Ventilating Engineers, London. Commencing salaries £895-£1,465 per annum.

7. ASSISTANT MECHANICAL, ELECTRICAL or BUILDING SERVICES ENGINEERS.
A University Degree in Mechanical or Electrical Engineering or Graduate Membership of the above Institutions. Commencing salaries £810-£1,000 per annum.

8. MECHANICAL, ELECTRICAL or BUILDING SERVICES DRAUGHTSMEN.
Ordinary or Higher National Certificate in Mechanical or Electrical Engineering, or equivalent examination, and at least three years' experience in draughting, design and calculations. Commencing salaries £720-£1,000 per annum.

Enquiries, mentioning this paper and quoting reference No. 3/74/133, also stating the type and number of position sought, should be addressed to the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Full details of duties, experience desired, and general information on the conditions of employment in the New Zealand Public Service, together with application forms, will then be furnished. 6949

CIVIL AND ELECTRICAL ENGINEERS

required by

CITY OF WINNIPEG HYDRO-ELECTRIC SYSTEM.

Permanent positions in Winnipeg, Manitoba, Canada.

Graduation from a recognised University or College essential.

CIVIL ENGINEERS

for design, construction and maintenance of dams, reinforced concrete buildings and steel structures.

Salary range $375.00 to $590.00 per month.

ELECTRICAL ENGINEERS

for design and construction of electric utility generation, transmission and substation equipment.

Salary range $375.00 to $524.00.

ELECTRICAL ENGINEER

for utility operation and maintenance work.

Salary range $375.00 to $471.00.

Salary within range according to experience and qualifications.

Any qualified engineer emigrating to Western Canada interested in any of the above positions, please apply to

PERSONNEL SUPERVISOR,
CITY HYDRO,
55, PRINCESS STREET,
WINNIPEG, 2, MANITOBA.

Please give full details as to education, qualifications, experience, age, salary expected, and probable date of availability.

7108

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

FOURTH ASSISTANT ENGINEER, BOURNE TRANSMISSION SECTION OFFICE (Vacancy No. 137/57/ER).

Applicants should have experience in the maintenance and operation of 132-kV overhead lines, transformers and substations.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 5 (£810-£1,035 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th August, 1957.

SHIFT CHARGE ENGINEER, BURTON-ON-TRENT POWER STATION (Vacancy No. 91/57/ER).

Sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary in accordance with Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th August, 1957.

STATION CHEMIST, BURTON-ON-TRENT POWER STATION (Vacancy No. 141/57/ER).

Previous experience in a power station laboratory is essential and candidates should preferably be Associates of the Royal Institute of Chemistry or hold equivalent qualification.

Candidates must be familiar with the methods of sampling and analysis of coal, water and oil, together with the interpretation and application of the analytical results.

Salary will be in accordance with Class E, Grade 7 (£835-£880 per annum).

Closing date for receipt of applications, 29th August, 1957.

SENIOR DRAUGHTSMAN (Civil), GENERATION (Construction) DEPT. (Vacancy No. 112/57/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:—

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, bridges and culverts.

Salary will be within Grade 4 (£895-£995 p.a.) or Grade 5 (£760-£860 p.a.) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 5th September, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

7064

SOUTHERN RHODESIA GOVERNMENT

Vacancy: Inspector of Machinery, Labour Dept.

Salary Scale £1,220 × £50 to £1,620 p.a.

APPLICANTS must be qualified engineers in possession of an approved certificate in mechanical or electrical engineering or the Ministry of Transport First Class Marine Engineers' Certificate, and have had good all-round experience.

Duties will include the inspection of all classes of boilers, elevators and general machinery, and previous experience in inspection work of this kind, particularly the inspection and testing of boilers, will be a recommendation.

Application forms and further details from Secretary (R), Rhodesia House, 429, Strand, London, W.C.2. Closing date 31st August.

7056

SOUTH EASTERN ELECTRICITY BOARD

SHOWROOM ASSISTANT (Male), Kingston and District.

Salary £500-£600 p.a. plus London weighting under N.J.C. Grade 1. Superannuable. Applicants must have knowledge of electrical appliances and should be experienced in general showroom and cashier duties and have the ability and initiative to promote sales. Appointment is primarily for Surbiton showroom, but the person appointed must be prepared to work in any of the Kingston and District showrooms.

Applications, naming two referees, on forms from D. C. Thomson, B.Sc., M.I.E.E., Kingston and District Manager, SEEBOARD, 22 Claremont Road, Surbiton, Surrey, by 28th August, 1957.

SENIOR DEMONSTRATOR, Twickenham and Richmond District.

Salary according to qualifications and experience within N.J.C. Grade 2, £615-£20-£675 plus London weighting. Superannuable. Applicants should hold a recognised qualification in Domestic Science and the E.A.W. Certificate: they should be experienced in giving talks and demonstrations on all types of domestic apparatus and be willing to assist in general showroom work.

Applications, naming two referees, on form from J. D. Parkinson, A.M.I.E.E., A.I.Mech.E., Twickenham and Richmond Manager, SEEBOARD, 42, York Street, Twickenham, Middlesex, by 28th August, 1957

ASSISTANT ENGINEER, Swale District.

Salary £835 × £15-£880 p.a. under N.J.B. Class E, Grade 7. Superannuable. Applicants should hold Higher National Certificate or equivalent qualification in Electrical Engineering and have had experience in construction, operation and maintenance of overhead and underground distribution systems.

Applications naming two referees to: F. E. Fairbank, A.I.E.E., District Mnaager, SEEBOARD, 88a, High Street, Sittingbourne, by 28th August, 1957.

THIRD ASSISTANT DISTRICT ENGINEER, Lewes District.

Salary £740 to £785 p.a. under N.J.B. Class D, Grade 8. Superannuable. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 33 kV. Experience of D.C./A.C. changeover an advantage.

Applications, naming two referees, to G. R. Lincoln, Esq., Assoc.I.E.E., SEEBOARD, 80/81, High Street, Lewes, Sussex, by 28th August, 1957.

DISTRICT ENGINEER, Herne Bay/Canterbury District.

Salary under N.J.B. Class E, Grade 3, £1,065 × £25-£1,140. Superannuable. Applicants should be fully qualified, possess a sound general education and technical education and be experienced in the design, construction and maintenance of H.V. and medium pressure overhead and underground distribution systems. The appointment will involve standby duties.

Applications naming two referees to A. J. Hunt, Esq., Joint District Manager, SEEBOARD, 65, Mortimer Street, Herne Bay, Kent, by 14th August, 1957.

A. L. BURNELL,
Secretary.

7103

MUNICIPALITY OF BROKEN HILL, NORTHERN RHODESIA

Town Electrical Engineer

APPLICATIONS are invited from suitably qualified applicants fully conversant with electrical distribution, including operation, maintenance, planning and construction of future extensions.

Salary scale £1,320 p.a. rising by annual increments of £80 to £1,560 plus variable cost-of-living allowance now 21% of basic salary. The commencing salary will depend on qualifications and experience.

Superannuation fund, free furnished accommodation, or allowance in lieu, free passage to Broken Hill for the officer, his wife and children under 16 years, plus removal expenses up to £75.

A total of 52 days' paid annual leave and free return fares to coast every two years.

Write MERZ AND McLELLAN, ESHER, SURREY, for further information. 7074

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for post (a) and Corporate Membership for posts (b) an advantage.

(b) SHIFT CHARGE ENGINEER, BATTERSEA POWER STATION (Vacancy No. 57/707).

Sound engineering training necessary followed by considerable experience in operation and maintenance of modern high-pressure, high-temperature power station plant. Salary Class L, Grade 7= £1,285 plus £123 10s. shift.

CHEMICAL ASSISTANT, DEPTFORD WEST POWER STATION (Vacancy No. 57/708).

Candidates should have G.C.E. at advanced level and an interest in investigational work in laboratory and on power station plant. Salary T.S.T. Scale, £315 (age 18) to £580 (age 22).

(b) EFFICIENCY ENGINEER, DEPTFORD WEST POWER STATION (Vacancy No. 57/709).

Some operating experience with responsibility through departmental superintendents for efficient operation of boiler and turbine plant. Salary Class J, Grade 7 = £1,115 p.a.

(a) FOURTH ASSISTANT ENGINEER (Efficiency and Testing), CHIEF GENERATION ENGINEER (O) DEPARTMENT (located Barking Power Station) (Vacancy No. 57/710).

Good technical education and experience in testing and/or operation of mechanical plant in power station. Salary Class AX/EX, Grade 6 = £750/£985 p.a.

THIRD ASSISTANT ENGINEER (Civil), CONSTRUCTION DEPARTMENT, DIVISIONAL H.Q. (Vacancy No. 57/711).

Applications are invited for above position in Department of Chief Generation Engineer (Construction) to work with experienced team directly concerned with design and construction of modern power stations. Opportunities exist to obtain necessary qualifying experience for Institution of Civil Engineers. Frequent visits to sites will be part of normal duties. Salary Class AX/EX, Grade 4 = £945/£1,190 p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement.

7059

POWER CONTROL FOREMEN

VACANCIES exist with the Operations Branch of the Industrial Group of the UNITED KINGDOM ATOMIC ENERGY AUTHORITY at CHAPELCROSS WORKS, ANNAN, DUMFRIESSHIRE, SCOTLAND.

DUTIES : To be responsible, on shift, to the Power Charge Engineer for the main electrical control room involving the synchronising and loading of turbo-alternators, E.H.V. switching and co-operation with the South of Scotland Electricity Board.

QUALIFICATIONS AND EXPERIENCE : Applicants must have served a recognised engineering apprenticeship and have had similar experience in a conventional power station. Possession of an Ordinary National Certificate or equivalent may be an advantage.

A period of training will be given at another of the works operated by the Industrial Group.

SALARY will be assessed within the scale £835 (at age 30) to £1,000 p.a.

A contributory pension scheme is in operation.

Authority houses for renting by successful married candidates may be available, or alternatively substantial assistance may be given towards legal expenses incurred in private purchase.

Send a postcard for an application form, quoting reference 1992, to the Recruitment Officer, United Kingdom Atomic Energy Authority, Industrial Group Headquarters, Risley, Warrington, Lancs.

Closing date, 26th August, 1957. 7023

***Situations Vacant** (continued)*

FOREMAN (ELECTRICAL)

A VACANCY exists with the Operations Branch of the Industrial Group of the UNITED KINGDOM ATOMIC ENERGY AUTHORITY at DOUNREAY WORKS, THURSO, CAITHNESS, SCOTLAND.

DUTIES: To be responsible for the maintenance of a wide variety of electrical plant and equipment associated with chemical and reactor plant, minor construction work, and the operation of a planned maintenance system.

QUALIFICATIONS AND EXPERIENCE: Applicants must have served a recognised engineering apprenticeship, preferably in heavy electrical work, and have had considerable experience of the duties detailed above. Previous experience of controlling skilled labour and the ability to organise are essential. Possession of an Ordinary National Certificate or equivalent may be an advantage.

SALARY will be assessed within the scale £835 (at age 30) to £1,000 p.a., which is due to be increased by approximately 5%.

A contributory pension scheme is in operation.

Houses for renting by the Authority's staff are in course of erection at Thurso and hostel accommodation may be available for single and unaccompanied married persons. Financial assistance towards removal expenses may be given in certain cases as well as towards legal expenses incurred in private purchase.

Send a postcard for an application form, quoting reference 2013, to the Recruitment Officer, United Kingdom Atomic Energy Authority, Industrial Group Headquarters, Risley, Warrington, Lancashire.

Closing date, 2nd September, 1957. 7022

THE

INSULATION LABORATORIES

of

THE ENGLISH ELECTRIC COMPANY

STAFFORD

THERE is an opening for an Electrical Engineer or experimental Physicist to conduct development work on insulation engineering problems at Stafford. Particular experience of insulation techniques is not essential.

There are also openings for younger technical people with a G.C.E. "A" level in Maths., Physics or Chemistry.

Write giving relevant details to

Central Personnel Services,

336/7, Strand,

London, W.C.2,

quoting Ref. ER.1295A.

7031

BRITISH KLOCKNER SWITCHGEAR LIMITED
Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

CENTRAL ELECTRICITY AUTHORITY

South Western Division

Technical Staff Vacancies

(a) STATION SHIFT CONTROL ENGINEER required at EAST YELLAND POWER STATION.

Superannuation scheme. Salary N.J.B. Class H, Grade 10, £835-£880 (plus 10% shift allowance).

Candidates should possess good technical qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

(b) Applications are invited for the superannuable N.J.B. appointment of DEPUTY POWER STATION SUPERINTENDENT at PORTISHEAD B POWER STATION.

Class J, Grade 3, £1,435-£1,540 (ultimately Class K).

Candidates should have had a sound technical education and considerable practical experience in the operation, maintenance and administration of a modern H.P. power station equipped with P.F. fired boilers. They should preferably be corporate members of one of the appropriate recognised professional institutions.

(c) FOURTH ASSISTANT ENGINEER required in the TECHNICAL DEPARTMENT.

Superannuation scheme. Salary N.J.B. Class AX/CX, Grade 6, £710 × £25 to £835-£885.

Applicants should hold the H.N.C. or other qualifications leading to A.M.I.E.E.

An interest in electrical testing is essential and some knowledge of protective gear and switchgear is desirable. Experience with a leading electrical manufacturer would be an advantage.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 26th August, 1957, for (a) and (b), and 30th August, 1957, for (c). 7078

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Northern Area

Garry/Moriston Generation Group

Vacancy for Group Control Engineer

GROUP CONTROL ENGINEER required for the Garry/Moriston Group Control Centre at Fort Augustus Switching Station. Duties, which will be on a shift basis, will be those normally associated with switching operations and load transfers on an extensive E.H.V. system interconnecting 132 kV lines and a number of hydro-electric stations. Applicants should have a sound technical training up to at least Higher National Certificate standard and practical experience in power station operation.

Salary Schedule A, Class F, Grade 7, £885/£930 plus 10% shift allowance. Superannuation scheme applicable.

Applications stating age, qualifications and experience should be sent to Generation Engineer, Garry/Moriston Group, Auchterawe Switching Station, Fort Augustus, Inverness-shire, not later than 2nd September, 1957. 7110

EAST MIDLANDS ELECTRICITY BOARD

Second Assistant District Engineer, Leicester Sub-Area

APPLICATIONS are invited for the appointment of a SECOND ASSISTANT DISTRICT ENGINEER in the Leicester Sub-Area.

Applicants should preferably possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering, and have had experience in construction, operation and maintenance of overhead and underground systems up to and including 11 kV.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement Class F, Grade 8 (£835/£880 per annum).

Applications giving details of age, qualifications, education and experience should be forwarded to the Manager, Leicester Sub-Area, Charles Street, Leicester, so as to reach him within fourteen days of the date of this advertisement. 7113

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following posts:—

ASSISTANT ENGINEER (Efficiency and Testing), CLIFF QUAY GENERATING STATION.

Salary Class K, Grade 7, £1,160 × £25 to £1,235 per annum.

Applicants should possess the Higher National Certificate in Mechanical and/or Electrical Engineering, or other equivalent qualifications, and have had previous experience in a large modern generating station.

The successful applicant will be responsible for the efficient and economical operation of the generating plant, the preparation of statistics and the keeping of technical records.

GENERAL ASSISTANT ENGINEERS, SOUTH DENES (GREAT YARMOUTH) GENERATING STATION.

Salary Class H, within the range of Grades 16-13, £540 × £15 to £730 per annum.

Commencing salary will depend upon qualifications and the duties and responsibilities of the post offered.

The duties of those appointed will vary, but will include as a general rule the operation and control under supervision of generating plant, and will provide an opportunity to gain experience in the technical operation of plant in a generating station to give a suitable basis for promotion to higher technical posts.

Applicants should possess a sound general and technical education, and preference will be given to those possessing a Higher National Certificate with previous experience in a generating station.

Apply by 31st August, 1957, giving age, details of experience and qualifications, to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts. 7063

COUNTY BOROUGH OF CROYDON—EDUCATION COMMITTEE

Croydon Technical College, Fairfield, Croydon
Principal: H. Falkner, M.Sc.(Wales), B.Sc.(Lond.), A.Inst.P.

APPLICATIONS are invited for the following full-time teaching post.

ELECTRICAL ENGINEERING DEPARTMENT.

ASSISTANT GRADE B. The duties will include the teaching of electrical installation both Theory and Practice to City and Guilds standards.

Candidates for this appointment should possess appropriate qualifications, and have had suitable industrial experience.

The salary will be in accordance with the Burnham Technical Scale (London Area).

Further particulars and forms of application may be obtained from the undersigned on receipt of a stamped addressed envelope, and completed forms should be returned to the Principal within 14 days of the appearance of this advertisement.

R. WEARING KING,
Chief Education Officer.

Education Office,
Katharine Street,
Croydon. 7107

ELECTRICAL ENGINEERS (SENIOR GRADE)

required by the ELECTRICITY AUTHORITY OF CYPRUS for two tours each of two years, with prospect of permanency.

Salary (including bonus and overseas and temporary allowances) in scale £2,054 rising to £2,265 a year. Superannuation scheme and medical fund. Outfit and settling-in allowances totalling £35 (£75 if accompanied by wife). Free passages and furnished quarters. Children's educational grants in certain circumstances. Liberal leave on full salary.

Candidates must have had sound training in both electrical and mechanical engineering with experience in charge of District or equivalent, and have competent knowledge of operation, maintenance and development of underground and overhead systems up to 11 kV.

Write to the Crown Agents, 4, Millbank, London S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41525/EF. 7072

CENTRAL ELECTRICITY AUTHORITY

London Division

Transmission Department

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London allowance.

THIRD ASSISTANT ENGINEER
(Vacancy No. 57/712).

Applicants should preferably be Corporate or Graduate Members of I.E.E. or equivalent, and should have experience in design, layout and site installation of high-voltage substation equipment, together with knowledge of site testing and commissioning of substation plant. Salary Class AX/EX, Grade 4 = £945/£1,190 p.a.

THIRD ASSISTANT ENGINEER
(Vacancy No. 57/713).

Applicants should have sound practical experience in construction of high-voltage overhead line and cable systems and carrying out and plotting of level and theodolite surveys; should preferably be Corporate or Graduate Members of the I.E.E. or equivalent. Salary Class AX/EX, Grade 4 = £945/£1,190 p.a.

ENGINEERING DRAUGHTSMAN
(Vacancy No. 57/714).

Applicants should have received good general education and general drawing office experience covering preparation of cable route records and surveying of cable routes and training in preparation of substation layouts and site surveying. Salary Schedule D, Grade 6 = £635/£755 p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement. 7060

JOSEPH LUCAS (ELECTRICAL) LTD.

Great King Street, Birmingham

AS a result of expansion of our road vehicle lighting development department to meet the growing demands of the motor industry we have vacancies for

ENGINEERS AND PHYSICISTS

of at least H.N.C. standard to work on the following projects. Experience or knowledge of photometric and electrical instruments desirable.

The design and development of vehicle lighting equipment and in particular the development of optical systems for future projects.

Development work on specific problems related to vehicle lighting equipment and the design of laboratory and factory control equipment for these products.

In addition there are vacancies for SENIOR DESIGNERS required to work in close co-operation with car designers and styling engineers on the design of lighting equipment for new car models. Experience in the design of pressed metal components for large quantity production desirable.

All of these positions carry attractive starting salaries and provide excellent prospects for advancement. Staff pension fund.

Apply in writing, stating age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/156.

127

EDINBURGH CORPORATION

SUPERVISOR required for Lighting Department, with experience in estimating and supervising electrical contracting work. Salary £600 rising to £685.

Applications, with full particulars, not later than 26th August to Engineer and Manager, Lighting and Cleansing Department, 329, High Street, Edinburgh, 1. 7021

APPLICATIONS are invited for pensionable posts as

EXAMINERS
in the
PATENT OFFICE

to undertake the official scientific, technical and legal work in connexion with Patent applications.

Age at least 21 and under 35 years on 1st January, 1957, with extension for regular Forces' service.

Candidates must have (or obtain in 1957) 1st or 2nd Class Honours in Physics, Organic or Inorganic Chemistry, Mechanical or Electrical Engineering or in Mathematics, or an equivalent qualification, or have achieved a professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E, A.R.I.C. For a limited number of vacancies candidates with 1st or 2nd Class Honours Degrees in other subjects—scientific or otherwise—will be considered. Exceptionally, candidates otherwise qualified by high professional attainments will be considered.

Starting pay for 5-day week of 42 hours in London between £605 and £1,120 (men) according to postgraduate (or equivalent) experience and National Service. Maximum of scale £1,345. This salary scale is being increased by approximately 5%. Women's pay above £605 slightly lower, but is being raised to reach equality with men's in 1961. Good prospects of promotion to Senior Examiner, rising to £2,000 (under review), and reasonable expectation of further promotion to Principal Examiner.

Application form and further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting S.128/57 and stating date of birth.

Interview boards will sit at intervals, as required. Early application is advised.

7041

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Wilton Works

ENGINEERING DESIGNERS

who possess Higher National Certificate or its equivalent, and have experience in the following branches of engineering:

MECHANICAL, CIVIL,
ELECTRICAL, STRUCTURAL,

are required to fill immediate vacancies in the Design Office working on the development of this 2,000-acre factory site, at which is centred much of the company's large expansion programme.

HOUSING: After joining the staff married men will receive a reasonable refund of removal (including travel) expenses and, to assist them in house purchase, facilities are available in approved cases for substantial loans. In addition, legal charges will be advanced. A lodging allowance will be paid for a period to married men selected for these appointments whilst maintaining two homes.

COMMENCING SALARIES: These vary between £535 and £1,000 per annum according to age, experience and qualifications.

The Design Offices are situated in the parklands of Wilton Castle, which lies at the foot of the Cleveland Hills.

Please write to me: Staff Manager, Imperial Chemical Industries Limited, Wilton Works, Middlesbrough, Yorkshire, quoting reference 414/6.

6975

EDINBURGH CORPORATION

TECHNICAL ASSISTANT required for Lighting Department. Minimum qualification National Certificate in Electrical Engineering. Commencing salary up to £670.

Applications, with full particulars, not later than 26th August to Engineer and Manager, Lighting and Cleansing Department, 329, High Street, Edinburgh, 1. 7020

NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER, EAST DISTRICT, MANCHESTER.

The duties will include assisting in the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, keeping of substation records, etc.

Applicants should hold H.N.C. in Electrical Engineering and should have had practical experience in substation work, operation, cable laying and jointing, etc.

Salary scale £740 × £15 to £785 p.a., Grade G.11. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, by 24th August, 1957.

THIRD ASSISTANT ENGINEER
(Planning and Design),
SUB-AREA ENGINEER'S
DEPARTMENT, OLDHAM.

Applicants should have had experience in the planning of H.V. and L.V. systems, estimating, system calculations and general technical investigations. Preference given to applicants who hold the H.N.C. (or equivalent) in Electrical Engineering.

Salary scale £935 × £20 to £995 p.a., Grade K.10. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, by 24th August, 1957. 7058

TELEPHONE CABLE ENGINEER

for a wide range of duties associated with technical control in the manufacture of paper and thermoplastic telephone cables. The work involves the investigation of processes, the study and analysis of test data and the technical supervision of experiments.

Technical training should be to Higher National Certificate level in electrical engineering. Salary will be assessed generously according to age, qualifications and experience.

Prospects and conditions of employment are excellent, including bonus and superannuation schemes, five-day week, etc.

Please submit applications

to

Works Personnel Officer,
Reference P/2,
British Insulated Callender's Cables Limited,
Prescot, Lancashire.

6974

HUDDERSFIELD TECHNICAL COLLEGE

Principal: Dr. W. E. Scott, M.B.E.

DEPARTMENT OF ELECTRICAL ENGINEERING

REQUIRED as soon as possible, GRADE B ASSISTANT to teach subjects in the City and Guilds Electrical Installation and Technicians' and National Certificate courses. Applicants should possess the Higher National Certificate in Electrical Engineering or equivalent qualification. Teaching and industrial experience would be an advantage.

Burnham Scale, viz., £650 × £25 to £1,025 p.a. plus appropriate allowances for training, etc.

Further particulars and forms of application, which must be returned as soon as possible, obtainable from the Principal, Technical College, Queen Street South, Huddersfield.

H. GRAY,
Chief Education Officer.

1st August, 1957. 7066

***Situations Vacant** (continued)*

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Birmingham and District Sub-Area

PURCHASING OFFICER (Headquarters).

Electrical engineering background and knowledge of the markets in general, electrical supplies, equipment and appliances and of stock control desirable. Appropriate qualifications an advantage. Salary £1,285/£1,405 per annum (N.J.C. Grade 9).

Apply by letter, within seven days, stating age, experience, present salary and position to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham 4.

Shropshire and Herefordshire Sub-Area

THIRD ASSISTANT ENGINEER (Control) (Headquarters).

The successful applicant will be required to take charge of the switching operations of the 11-kV, 33-kV and 66-kV systems on shift rota. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade H.10).

GENERAL ASSISTANT DISTRICT ENGINEER (Hereford).

The successful applicant will be required to assist in the planning, construction and maintenance of H.V. and L.V. overhead and underground cables. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. Grade E.11).

Apply by letter within fourteen days, stating age, experience, present salary and position, to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary. 7120

ELECTRICAL DRAUGHTSMEN

required by

J. LYONS & CO. LTD.

for

Production of Power Schemes,

Design of Installations and

Process Control Systems.

5-day Week. Pension scheme.

HIGHLY EXPERIENCED—

HIGHLY PAID.

Ring RIV. 2040, Ext. 226.

It's quicker by phone. 7101

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of PRINCIPAL ASSISTANT ENGINEER (Mechanical/Electrical) in the Generation/Construction Section of the Chief Engineer's Department.

Preference will be given to applicants who hold a degree in engineering, are Corporate Members of the Institution of Mechanical or Electrical Engineers, or possess equivalent qualifications. They should have had experience in the design and construction of turbo-alternators, boilers, coal and ash handling plant, high-pressure steam and water piping, and other ancillary work. Experience of the preparation of specifications and estimates and a knowledge of thermo-dynamics and hydraulics will be an advantage.

The position is superannuable. The salary will be in accordance with Scale 3 of the Managerial and Higher Executive Salary Scale £1,675/£1,825 per annum).

Applications should be submitted on the standard form, which may be obtained from the undersigned, and should reach this office not later than Wednesday, 28th August, 1957. Please quote reference E.37/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
9th August, 1957. 7111

SOUTH WESTERN ELECTRICITY BOARD

Devon Sub-Area

(1) SECOND ASSISTANT DISTRICT ENGINEER, TORBAY.
Salary N.J.B. F.7 (£885/£930 p.a.).

The successful candidate will be responsible for the preparation of construction programmes and organisation and supervision of all the District construction work, involving o/h lines, u/g cables, building and equipping substations. He will also be responsible for keeping the necessary records and dealing with accountancy statements in connection with the costs of completed works.

Candidates must have considerable experience in the organising and supervision of field construction work. An engineering degree or the H.N.C. will be an advantage.

(2) SECOND ASSISTANT DISTRICT ENGINEER, WEST DEVON.
Salary N.J.B. D.7 (£790/£835 p.a.).

Duties include the supervision of o/h and u/g mains construction, operation, repairs and maintenance work; operation and switching of distribution network up to and including 33 kV, and dealing with fault conditions, etc. Standby duties.

Applications on standard form AE6/ACT, obtainable from (1) District Manager, Electric House, Union Street, Torquay; (2) District Manager, 20, High Street, Bideford, should be returned by 27th August. 7096

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

Appointment of General Assistant Engineer, Technical Department

APPLICATIONS are invited for the above appointment in the Protective Gear and Electrical Plant Testing Section with headquarters at Newcastle.

The duties will consist in assisting with the examination of drawings and the preparation of wiring diagrams, and also in the commissioning and maintenance of electrical protective gear.

Applicants should possess a qualification of at least a National Certificate in Electrical Engineering and have had engineering works training. Experience of protective gear would be an advantage.

The salary for this appointment (which is superannuable) will be in accordance with Schedule B, Grade 7, of the National Joint Board Agreement (£550-£685 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 31st August, 1957. 7062

ELECTRICIANS

required for

Power Station Contract Work

IN MIDLANDS.

London rates and out allowances paid.

Long-term contract.

Periodical travel facilities home.

Applications to

Employment Manager

JOHNSON & PHILLIPS LTD.

Charlton, London, S.E.7

7080

THE ELECTRICAL RESEARCH ASSOCIATION

requires an ASSISTANT SECRETARY to a number of Technical Committees. Applicants should be able to prepare documents for committees and write minutes of meetings. Salary according to qualifications.

Applications to be addressed to the Personnel Officer, The Electrical Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey. 7045

EDUCATION COMMITTEE OF THE COUNTY OF STIRLING

County Mining Institute, Falkirk

APPLICATIONS are invited for the post of ASSISTANT TEACHER of ELECTRICAL INSTALLATION WORK at the above further education centre.

Applicants should hold the Electrician's Extra Certificate or its equivalent. The successful applicant will be expected to give instruction to non-mining day release students following City and Guilds Course B in Electrical Installation Work.

Scale XLVIII of the Teachers' Salaries (Scotland) Regulations, 1956, £600 - £1,045, will apply, with placing for National Service, industrial experience, etc. An increase of £55 per annum will be payable if the teacher appointed has successfully attended, or attends after appointment, a short course of teacher-training.

Letters of application detailing qualifications and practical experience, together with copies of testimonials, should reach the undersigned not later than Saturday, 24th August, 1957.

WILLIAM J. GOLDIE,
Director of Education.

Education Offices,
Spittal Street, Stirling.
5th August, 1957. 7043

EASTERN ELECTRICITY BOARD

Northmet Sub-Area. 98/57.R

Sub-Area Engineer (Ref. 691) (Revised Advertisement)

CANDIDATES should be Corporate Members of the Institution of Electrical Engineers and must have had extensive experience in the planning, operation, maintenance and construction of large distribution systems covering both urban and rural areas.

The post has wide engineering interest and involves responsibility for extensive capital and revenue works and the control of a large staff.

The appointment is superannuable and the revised salary will be in accordance with Class E, Grade 6 of the National Managerial and Higher Executive Grades Agreement (£2,500-£2,700) plus London allowance.

Applications to be forwarded to C. C. Hill, B.Sc.(Eng.), M.I.E.E., M.I.Mech.E., Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14, so as to be received not later than Monday, 9th September, 1957.

Candidates who submitted an application in response to the previous advertisements need not re-apply. 7119

PLUMBER - JOINTERS

required for

Contract Work.

To work on cables up to 11 kV.

London rates and allowances paid.

Daily transport from London available for certain contracts if required.

Applications to

Employment Manager

JOHNSON & PHILLIPS LTD.

Charlton, London, S.E.7

7081

SIMPSON BROTHERS (OF HAPTON) LTD. have the following vacancies.

FOREMAN for electrical assembly shop. Experience of light fabrication and machining an advantage.

FOREMAN for coil winding and transformer shop.

ASSISTANT to Production Manager for light electro-mechanical production.

TECHNICAL REPRESENTATIVE. Knowledge of control gear and transformers an advantage.

Accommodation available.

Apply by letter to Magneto Works, Hapton, Burnley. 6954

EAST ANGLIAN REGIONAL HOSPITAL BOARD

Engineers and Draughtsmen

APPLICATIONS invited from suitably qualified persons for a range of (1) Mechanical and (2) Electrical Engineering posts for work in connection with development and design of a large new hospital and general hospital services for the whole region.

Posts are permanent and pensionable, providing scope in the entire field of hospital engineering covering surveys, reports, estimates, preparation of plans and specifications, and supervision of site works undertaken by contract in connection with (1) heating, ventilating, air conditioning, boiler plant, kitchens and laundries, water supplies, etc., and (2) lighting, power, call, radio, fire alarm, telephone and clock systems, lifts, emergency supplies and electrical services in connection with (1). Hospital experience, though desirable, is not essential.

All grades of staff are required ranging from Senior Assistants to Draughtsmen.

Applications giving full personal details of experience, qualifications, present salary, etc., with names of two referees, to Secretary of Board, 117, Chesterton Road, Cambridge, by 30th August, 1957. 7093

TECHNICAL INSTRUCTOR (ELECTRICIAN)

required by GOVERNMENT OF NORTHERN REGION, NIGERIA, for two tours of 18/24 months or three tours of 10/12 months.

Option of appointment either (a) on agreement with prospect of permanent and pensionable employment in salary scale (including inducement addition) £750 rising to £1,284 a year, or (b) on contract in salary scale (including inducement addition) £810 rising to £1,386 a year, with resettlement grant at rate of £100/£150 a year. Clothing allowance £45. Free passages for officer and wife. Assistance towards cost of children's passages and grant up to £288 annually. Liberal leave on full salary.

Candidates must have served full apprenticeship and possess C. and G. Certificate. They must be practical tradesmen with experience of domestic and industrial installation work. Apprenticeship training or other teaching experience desirable.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41933/EF. 7071

CABLE AND WIRELESS LIMITED

require TECHNICAL WRITER for preparation of instructions on new electronic and mechanical telecommunications apparatus from drafts of development engineers.

Candidates, aged 24-30, should possess B.Sc. or H.N.C. and, for preference, have had some industrial experience in communications field.

Commencing salary according to age and qualifications up to £1,000 and £850 per annum respectively, with prospects of promotion to higher grades.

Application should be made in writing, giving full particulars to Personnel Officer, Cable and Wireless Limited, Mercury House, Theobalds Road, London, W.C.1.

7109

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

FEMALE SHOWROOM ATTENDANT required. Experience of electrical appliances, consumers' enquiries, etc. Salary according to age and experience N.J.C. Scale £185/£520. E.D.A. Sales Diploma an advantage. Superannuation scheme subject to medical examination. Applications to be sent in by 24th August, 1957, to Area Manager, Showrooms, George Street, Oban. 7106

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Third Assistant District Engineer, Uddingston District

APPLICATIONS are invited for the above appointment. Applicants should possess the necessary technical qualifications and should have had a sound engineering training with some experience in the operation and maintenance of H.V. and L.V. underground and overhead distribution systems.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being F.9, salary £790/£835 per annum, which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the District Offices at Uddingston, and to take part in standby duty in accordance with the above agreement.

Application forms may be obtained from the undersigned and should be returned to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.
137, Almada Street,
Hamilton. 7095

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment :—

STATION SUPERINTENDENT, PETERBOROUGH GENERATING STATION.

Salary N.J.M.C., £1,500-£1,700 per annum.

Applicants should have had a good technical education and practical experience in the operation, maintenance and administration of a modern generating station.

Membership of a recognised engineering institution is desirable.

The successful applicant will be required to reside within a reasonable distance of the generating station.

Forms of application (AE.6/ACT) may be obtained from the Authority's Headquarters, or from any Divisional Offices of the Authority, and should be addressed to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts, to arrive not later than 31st August, 1957.

W. N. C. CLINCH,
Controller. 7079

ELECTRICAL/MECHANICAL ENGINEERING DESIGNER

THIS senior position with Merseyside company of medium size calls for rotating machine design ability, both electrical and mechanical, of a high order. Experience on control gear and systems, including electronics, is equally desirable.

The company, associated with a large group, expects to pay an attractive four-figure salary to a top-flight designer who is looking for a challenging position in which he can both develop and extend the company's existing range of products. These products are of small/medium size and special-purpose type.

First-class qualifications are necessary; adequate benefits are available. Applications, which should include age and salary indication, will be treated most confidentially.—Box 7027.

SENIOR TEST ENGINEER

LEADING switchgear manufacturer seeks applications for the post of SENIOR TEST ENGINEER with considerable future prospects. Duties involve supervision of routine switchgear testing department and initiation of research in comprehensively equipped laboratory. Non-contributory pension scheme in operation. Please state age, qualifications and salary required.—Box 7030.

PILKINGTON BROTHERS LIMITED

invite applications for a position in the Estimating Section of a medium-sized drawing office. The work covered by this section includes :—

1. The preparation of approximate estimates for buildings and plant from brief specifications and/or arrangement drawings.
2. Preparation of estimates for capital sanction from final arrangement and detail drawings. This work requires an intimate knowledge of the mechanical engineering trades and practices.
3. Valuation of plant and buildings for asset verification and fire insurance purposes.

Applicants should have some experience in one or more of these fields and should be qualified to O.N.C. standard.

Minimum starting salary for applicants having suitable experience and qualifications is £721 p.a. at 25.

The company operates a contributory pension scheme, assists with house purchase, and has excellent canteen, welfare and recreational facilities.

Applications giving brief details of career should be sent to the Chief Engineer, Pilkington Brothers Limited, Cowley Hill Works, St. Helens. 7032

DEVELOPMENT ENGINEER

EXPERIENCED Electrical Development Engineer, B.Sc., or H.N.C., required to take charge of research and testing laboratory situated 25 miles south of London.

Experience must comprise heavy current, medium-voltage range of rotating machines, transformers and control gear, and applicant must be capable of working on both practical and theoretical problems on his own initiative.

This is a permanent position in an expanding department with good future prospects. Existing holiday arrangements honoured. Pension scheme.

Apply, giving age, experience, qualifications and salaries received to :—

BRITISH GECO ENGG. CO. LTD.
Adelaide House, London Bridge,
London, E.C.4

7046

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Fourth Assistant Engineer (Commercial) at Area Headquarters

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER (Commercial) at Area Headquarters.

Applicants should have had a commercial engineering training with experience in industrial supplies.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A. The present classification and grading is L.13; salary £835/£880 per annum. The post is superannuable.

Application forms may be obtained from the undersigned and should be returned to this office within 14 days of the date of this advertisement.

DUGALD SMITH,
Manager.
137, Almada Street,
Hamilton. 7094

SALES ENGINEERS

IGRANIC ELECTRIC Co. Ltd. wish to appoint men with electrical engineering experience to fill additional junior and senior positions on their outside sales engineering staff. Applicants for senior appointments must also have had actual sales engineering experience.

The present vacancies exist in Glasgow, Manchester, Leeds, London and Cardiff and applications indicating district preferred should be addressed to:—

The Personnel Officer,
IGRANIC ELECTRIC CO. LTD.,
Bedford. 7105

Situations Vacant *(continued)*

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

Fourth Assistant Engineers, Transmission Dept.

APPLICATIONS are invited for vacancies for FOURTH ASSISTANT ENGINEERS for work connected with the construction of overhead lines and substation equipment comprising transformers, cables and switchgear in the Transmission Department, North Eastern Division, with headquarters at Newcastle upon Tyne.

Applicants should preferably possess a Higher National Certificate in Electrical Engineering or equivalent qualifications.

The salary for the appointments (which are superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 6 (£710-£910 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 31st August, 1957. 7061

CUMBERLAND COUNTY COUNCIL

County Architect's Department

APPLICATIONS are invited for the following appointments. N.J.C. service conditions. Posts pensionable. Subject to medical examination. Commencing salary according to qualifications. Experience with schools and similar building installations required.

(a) SENIOR ASSISTANT ENGINEER (Heating).
A.P.T. Grade VI (£902-£1,107).
Applicants must be A.M.I.H.V.E.

(b) ASSISTANT ENGINEER (Electrical).
A.P.T. Grade IV (£727 15s. to £907 2s. 6d.).
Applicants must be A.M.I.E.E. or Grad. Member I.E.E.

Application forms and further particulars may be obtained from John H. Haughan, F.R.I.B.A., County Architect, 15, Portland Square, Carlisle, to whom completed applications should be returned not later than Friday, 6th September, 1957.

G. N. C. SWIFT,
Clerk of the County Council.
7055

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Wear Sub-Area

FOURTH ASSISTANT ENGINEER, Construction Section, Sub-Area Headquarters, Sunderland. Applicants should possess H.N.C. in electrical engineering or equivalent qualification and have had experience in preliminary work and construction of H.V. and L.V. overhead lines. Knowledge of underground cable and substation work an advantage.

Salary Schedule A, Class L, Grade 13, £835/£880. N.J.B. conditions of service.

York Sub-Area

FOURTH ASSISTANT ENGINEER, York District.

Salary Schedule A, Class F, Grade 11, £685/£730. N.J.B. conditions of service.

Applications stating age, qualifications and experience, to be received by the Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 7102

SOUTH WALES SWITCHGEAR LIMITED

require for Branch Office in N.W. England:

(a) OUTSIDE TECHNICAL ASSISTANT to sell, mostly to Contractors and Industrialists, transformers, cables and switchgear. Technical qualifications preferably H.N.C. (Electrical). Car driver essential.

(b) DRAUGHTSMEN for Layouts and schematic diagrams.

Apply, stating age, qualifications, experience and salary required, to: South Wales Switchgear Ltd., 3, Hawthorn Lane, Wilmslow, Cheshire. 7100

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

Kingston "B" Power Station

ASSISTANT ENGINEER (Projects). An ideal opportunity exists for entrance to the power supply industry. The successful applicant will be responsible for handling all work in connection with additions and modifications at Kingston Power Station—from the initial preparation stage where alternative designs are being considered to the preparation of specifications and drawings suitable for sending to firms for quotations—and later following through the work being carried out by contractors on site.

Possession of H.N.C. in Mechanical or Electrical Engineering or its equivalent desirable. Salary Class G, Grade 9, £885 to £930 per annum, including London allowance.

Applications, giving details of education, present position, experience, etc., should be sent to the Station Superintendent, Kingston "B" Power Station, Downhall Rd., Kingston, so as to arrive by 24th August, 1957, quoting reference (305). 7042

EAST MIDLANDS ELECTRICITY BOARD

Third Assistant District Engineer: Melton Mowbray District, Lincolnshire Sub-Area

APPLICATIONS are invited for the position of THIRD ASSISTANT DISTRICT ENGINEER in the Melton Mowbray District of the Lincolnshire Sub-Area.

Candidates should preferably possess a qualification equivalent to the Higher National Certificate in Electrical Engineering and have had experience in construction, operation and maintenance of 11-kV and L.V. underground and overhead systems. Ability to drive a motor vehicle is essential, and the person appointed will be required to reside in or near the town of Melton Mowbray.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class D, Grade 9 (£685-£730 per annum).

Applications, giving details of age, education, experience and qualifications, should be forwarded to the Manager, Melton Mowbray District, Manor House, Burton Street, Melton Mowbray, so as to reach him within fourteen days of the issue of this advertisement. 7075

REQUIRED FOR SPECIALISED WORK:

An Electrical Sales Engineer and a Technical Engineer

AN important firm in N.E. London requires:

(a) An ENGINEER for sales and technical application work in connection with the Paper and Printing Trades. H.N.C. or equivalent qualification preferred, with some practical experience, if possible.

(b) A TECHNICAL ENGINEER to act as assistant to the Design Engineer in preparation of complete control schemes, involving the use of variable speed A.C. and D.C. motors utilising modern regulator technique and automation.

Applicants should be aged between 24-30; 5-day week. Pension scheme, staff canteen.

The section dealing with this work is at present being extended and there are good prospects for the right men.

Apply to Box 7028.

All applications will be treated in strictest confidence.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

DEMONSTRATOR required for Lorne and the Isles Area, centred at Oban. Candidates should have domestic science training and hold E.A.W. Certificate and be competent to plan and give cookery demonstrations and advise consumers on all types of domestic appliances.

Salary N.J.C. Grade I (£490 × £20 to £590). The successful candidate will be required to contribute to the Board's superannuation scheme and pass a medical examination.

Applications should be forwarded not later than 24th August to the Area Manager, Electricity Showrooms, George Street, Oban. 7065

HUDDERSFIELD CORPORATION PASSENGER TRANSPORT DEPARTMENT

Appointment of Technical Assistant (Engineering)

APPLICATIONS are invited for the above position on the permanent staff. Salary A.P.T. Grade II (£610-£692 per annum).

Applicants should have a Higher National Certificate in Electrical Engineering and also drawing office experience.

Duties will include technical development on both electrical and mechanical equipment fitted on motor buses and trolley buses, and also supervisory control of traction substations. Appointment is superannuable and subject to medical examination.

Full particulars, including age, experience and names of two referees, to reach the undersigned not later than Saturday, 24th August, 1957.

H. MUSCROFT,
General Manager.
John William Street,
Huddersfield. 6916

EAST MIDLANDS ELECTRICITY BOARD

General Assistant District Engineer, Nottingham Sub-Area

APPLICATIONS are invited for the position of GENERAL ASSISTANT DISTRICT ENGINEER in the Nottingham Sub-Area.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class F, Grade 11 (£685-£730 per annum).

Applicants should have some experience in the construction, operation and maintenance of overhead and underground distribution systems up to 11 kV and be prepared to undertake standby duty.

Preference will be given to applicants having a technical qualification equivalent to the Higher National Certificate in Electrical Engineering.

Applications, stating age, experience, qualifications and details of present appointment, should be forwarded to the Manager, Nottingham Sub-Area, Talbot Street, Nottingham, within fourteen days of the issue of this advertisement. 7076

FERRANTI LIMITED

Hollinwood, Lancs.

invite applications for appointments as

SENIOR RESEARCH AND DEVELOPMENT ENGINEERS

in the POWER ENGINEERING field, with particular reference to power transformers, high-voltage equipment, condenser bushings and impulse generators. Applicants must possess a first or second class honours degree in electrical engineering or physics, and must be capable of assuming individual responsibility for research and development projects. Salaries are based on an excellent scale and promotion prospects are good. A staff pension scheme and a dependants' insurance scheme are in operation.

Application forms can be obtained from T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference FWG.

7029

ELECTRIC MOTOR DESIGN

HOOVER LTD. have a vacancy for an ELECTRICAL ENGINEER for the design and development of their wide range of f.h.p. motors and relays.

Applicants should be qualified electrical engineers with some experience of motor design and knowledge of shaded pole and induction type motors would be an asset. Generous salary depending on age and experience.

Apply in writing stating age, qualifications and experience to the Employment Officer, Hoover Ltd., Western Avenue, Perivale, Greenford, Middlesex.

7025

EAST MIDLANDS ELECTRICITY BOARD

Second Assistant District Engineer, Burton District

APPLICATIONS are invited for the appointment of a SECOND ASSISTANT DISTRICT ENGINEER in the Burton District of the Derby and Burton Sub-Area.

Applicants should have a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering and have had experience in the construction, maintenance and operation of both underground and overhead systems up to and including 11 kV but particularly in the maintenance of substations, switchgear and protective gear.

The successful candidate will be required to undertake standby duties and reside in or near Burton-upon-Trent.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement Class F, Grade 7 (£885/£930 per annum).

Applications giving details of age, qualifications, education and experience should be forwarded to the Manager, Burton District, Derby and Burton Sub-Area, Horninglow Street, Burton-upon-Trent, so as to reach him within fourteen days of the date of this advertisement. 7115

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

CROYDON "B" POWER STATION, ASSISTANT CHARGE ENGINEER.

Experience of operation of power station plant is necessary, and possession of H.N.C. preferred.

Salary Class J, Grade 9, £985-£1,045 per annum, including London allowance, plus 10% shift allowance.

BRIGHTON "A" POWER STATION, ASSISTANT ENGINEER (Relief).

The successful applicant will have the opportunity of obtaining thorough experience in all aspects of power station work. Salary Class H, Grade 14, £635-£680 per annum plus 10% shift allowance when applicable.

N.J.B. conditions of service. Applications, giving details of education, age, present position, experience, etc., should be sent to the Station Superintendent according to location of vacancy at either Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey, or Brighton "A" Power Station, Portslade-by-Sea, Sussex, so as to arrive by 24th August, 1957, quoting reference (205). 7122

ELECTRICAL DEVELOPMENT ENGINEER

APPLICATIONS are invited from young electrical engineers holding either B.Sc., Grad. I.E.E. or equivalent to become a member of a development team working on specialist Electrical and Electronic Equipment.

Experience or knowledge of one or more of the following would be an advantage:

Servo Mechanisms
Magnetic Amplifiers
Fractional H.P. Motor Control
or General Electronic Experience.

A good salary is offered, together with excellent conditions of service. Assistance towards house purchase can also be offered if required.

Applications in writing or by telephone to:

Staff Officer,
BRITISH OXYGEN ENGINEERING LTD.
Angel Road, Edmonton, London, N.18.
Tel. Edmonton 3020. 7099

CITY OF PORTSMOUTH COLLEGE OF TECHNOLOGY

APPLICATIONS are invited from persons of suitable experience for the post of LABORATORY STEWARD in the Electrical Engineering Department.

The salary will be according to the scale £502 5s. to £589 7s. 6d. to £635 10s., with an efficiency bar at £589 7s. 6d. per annum. The person appointed will be required to commence duties as soon as possible.

Applications, with full particulars of experience, and the names of two referees, should be sent to the Registrar, College of Technology, Park Road, Portsmouth, as soon as possible. 7121

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Electrical) in the Construction (Transmission) Section of the Chief Engineer's Department at Board Headquarters.

Candidates should have experience in the construction, maintenance and operation of high-voltage substations, and preferably be Graduate or Associate Members of the Institution of Electrical Engineers.

The post is superannuable. Salary N.J.B. Schedule B, Class AX/DX, Grade 3, £1,055/£1,285 per annum.

Application forms may be obtained from the undersigned and must be returned within fourteen days following the publication of this notice. Please quote reference E.36/57.

ANDREW A. WALLACE,
Secretary.
P.O. Box 173,
351, Sauchiehall Street,
Glasgow, C.2.
2nd August, 1957. 7057

BOROUGH OF BARKING

Borough Engineer and Surveyor's Department

APPLICATIONS are invited for the post of SECOND ENGINEERING ASSISTANT (Mechanical and Electrical), Grade A.P.T. III, at a salary of £656/£784 2s. 6d. per annum, plus appropriate London weighting.

Candidates should have served an apprenticeship with a reputable firm and should hold the National Certificate or equivalent qualifications in electrical engineering. Preference will be given to those with experience in the layout and maintenance of heating and electrical installations in public buildings.

Application forms and particulars are obtainable from the Borough Engineer and Surveyor, and should be returned to the undersigned not later than 9 a.m. on the 26th August, 1957.

E. R. FARR,
Town Clerk.
Town Hall,
Barking. 7044

CITY OF WAKEFIELD

City Engineer's Department

Appointment of Electrical and Heating Assistant (Post No. 24), Grade A.P.T.IV, £727 15s. to £907 2s. 6d.

APPLICATIONS are invited for the above superannuable appointment in the City Engineer's Department at a salary in accordance with Grade A.P.T.IV, commencing at £727 15s. per annum.

Applicants should have had experience in the design and supervision of the various types of electrical and heating installations, and preference will be given to those holding the Higher National Certificate or similar qualifications.

Applications stating age, training, qualifications and experience, together with the names of two referees, to be sent to J. N. Sedgwick, A.M.I.C.E., City Engineer, Town Hall, Wakefield, by the 30th August, 1957. 7019

ELECTRICAL DESIGNER

sought by established manufacturers in London with world market for special-purpose precision machinery. Exceptional prospects for qualified electrical engineer having practical experience, aged 30-40, who is possessed of the "creative spark."

Only applicant fertile in ideas, with original and inventive mind and receiving recognition in his present post on this account, need apply.

Write, in confidence, Personnel Manager, Molins Machine Co. Ltd., Evelyn Street, London, S.E.8.

7026

SURREY COUNTY COUNCIL

APPLICATIONS invited for appointment of ELECTRICAL INSTALLATIONS DRAUGHTSMAN GRADE I, £543 5s. to £625 5s. p.a. plus London allowance of up to £30 p.a. according to age.

Full details, present salary and 3 copy testimonials to County Architect, County Hall, Kingston-on-Thames, as soon as possible. 7010

EAST MIDLANDS ELECTRICITY BOARD

Third Assistant District Engineer, Matlock District

APPLICATIONS are invited for the position of THIRD ASSISTANT DISTRICT ENGINEER in the Matlock District.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class F, Grade 9 (£790-£835 per annum).

Applicants should have had experience in the construction, operation and maintenance of overhead and underground distribution systems up to 33 kV, and be prepared to undertake standby duty. Ability to drive a motor vehicle is essential.

Preference will be given to applicants having a technical qualification equivalent to the Higher National Certificate in Electrical Engineering.

Applications, stating age, education, experience, qualifications and details of present appointment and salary, should be forwarded to the Manager, Matlock District, East Midlands Electricity Board, Knowleston Place, Matlock, to reach him within fourteen days of the issue of this advertisement. 7112

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant District Engineer, Leicester Sub-Area

APPLICATIONS are invited for the appointment of a FOURTH ASSISTANT DISTRICT ENGINEER in the Leicester Sub-Area.

Applicants should preferably possess a technical qualification equivalent to the Higher National Certificate in Electrical Engineering and have had some experience in the construction, operation and maintenance of overhead and underground distribution systems up to and including 11 kV.

The successful candidate must be prepared to undertake standby duty.

The salary and conditions of the appointment will be in accordance with the National Joint Board Agreement, Class F, Grade 13 (£590/£635 per annum).

Applications stating age, qualifications, education, experience and details of present appointment should be forwarded to the Manager, Leicester Sub-Area, Charles Street, Leicester, so as to reach him within fourteen days of the date of this advertisement. 7114

ADMIRALTY

ELECTRICAL DRAUGHTSMEN experienced in all electrical engineering techniques required for unestablished appointments in BATH. Must be British subjects aged 21 and upwards, and have had basic training including apprenticeship (or equivalent) and drawing office experience in factories or shipyards, preferably with O.N.C. or H.N.C.

Starting pay according to age up to £680 (age 28 and above); higher for candidates with wide experience. Annual increments up to £780 maximum. Five-day week, 18 days' annual leave.

Prospects of permanency and promotion. Substantial grants towards travelling expenses for all candidates called for interview.

Apply giving age, technical qualifications, details of apprenticeship (or equivalent) and experience to Admiralty, C.E.II (114), Empire Hotel, Bath. 7011

AIR MINISTRY

WORKS Designs Branch requires in London and Provinces ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution, H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage.

Salaries in London up to £965 per annum. Somewhat lower in Provinces. Starting pay dependent on age, qualifications and experience. Long-term possibilities with promotion and pensionable prospects. 5-day week. 3 weeks' 3 days' leave a year. Liability for overseas service. Normally natural-born British subjects.

Write stating age, qualifications, employment details including type of work done, to any Employment Exchange, quoting Order No. Borough 604. 260

Situations Vacant (continued)

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—
GENERAL ASSISTANT ENGINEERS. S/13.938.

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule, the operation and control, under supervision, of generating plant. There are a number of these vacancies at generating stations in this Division.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary N.J.B. within scales £540-£730.

Special application forms for the above vacancies obtainable from P. D. A. Oliver, Divisional Secretary, 111, High Street, Portsmouth, should be returned by 28th August, 1957. 7124

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer (Operation and Maintenance), Leicestershire and Warwickshire Sub-Area

APPLICATIONS are invited for the appointment of a FOURTH ASSISTANT ENGINEER in the Sub-Area Engineer's Department at Sub-Area Headquarters, Hinckley.

Applicants should preferably possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering and have had experience in the operation and maintenance of H.V. and L.V. overhead and underground systems, and be conversant with the general testing work associated with the commissioning and subsequent maintenance of equipments of all types.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835/£880 per annum).

Applications stating age, qualifications, education, experience, present position and salary should be addressed to the Manager, Leicestershire and Warwickshire Sub-Area, Upper Bond Street, Hinckley, so as to reach him within fourteen days of the date of this advertisement. 7116

CENTRAL ELECTRICITY AUTHORITY

South Eastern Division

FOURTH ASSISTANT ENGINEER (Transmission), DIVISIONAL HEADQUARTERS, KINGSTON.

Duties include the examination of specifications and associated drawings relating to new schemes. The ability to lay out equipment and make preliminary drawings an advantage. Possession of H.N.C. an advantage. Salary Class AX/DX, Grade 6, £710-£910 per annum, plus London allowance.

Applications, giving details of education, experience, present position, etc, should be sent to the Establishments Officer, Central Electricity House, Lower Ham Road, Kingston-on-Thames, so as to arrive by 24th August, 1957, quoting reference (205). 7123

SOUTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT required, District 222 (Neath) in the West Central Sub-Area of the Board.

Salary: Class E, Grade 8 (£790/£835) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three references should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, to arrive not later than 26th August, 1957.

St. Mellons,
Cardiff. 7104

EAST MIDLANDS ELECTRICITY BOARD

Fourth Assistant Engineer (Construction), Leicestershire and Warwickshire Sub-Area

APPLICATIONS are invited for the appointment of a FOURTH ASSISTANT ENGINEER (Construction) in the Sub-Area Engineer's Department at Sub-Area Headquarters, Hinckley.

Applicants should preferably possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering, and should have had experience of H.V. and L.V. overhead and underground systems, particularly in the construction and equipment of substations, including protective gear, and preparation of specifications and the issue of enquiries for transformers, switchgear and associated equipment.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Class K, Grade 12 (£835/£880 per annum).

Applications stating age, qualifications, education, experience, present position and salary should be addressed to the Manager, Leicestershire and Warwickshire Sub-Area, Upper Bond Street, Hinckley, so as to reach him within fourteen days of the date of this advertisement. 7117

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

APPLICATIONS are invited for appointment as (1) SECOND ASSISTANT ENGINEER in the Stirling District of the Area at a salary within the scale £835/£880 per annum (N.J.B. E.7) and (2) ASSISTANT ENGINEER in the Falkirk District of this Area at a salary within the scale £685/£730 (N.J.B. F.11).

Both posts are superannuated and conditions of service will be regulated by the National Joint Board Agreement. The successful candidates will be required to reside within reasonable distance of the place of appointment.

Experience in electrical distribution work is essential and it is also desirable that applicants should have technical qualifications of at least Higher National Certificate standard.

Applications are to be submitted on forms which can be obtained from the undersigned, not later than 31st August, 1957.

JAMES G. CURTIS,
Area Manager,
Woodlands,
St. Ninians Road,
Stirling.
24th July, 1957. 6929

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Mains Maintenance)

BASINGSTOKE district of the No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 10 (£685 × £15 to £730 per annum). N.J.B. conditions of service.

Duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

The successful candidate will be required to contribute to the C.E.A. and Area Boards (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from any Sub-Area or District office and returned to the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, not later than 26th August, 1957. 7134

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

NORTH WESTERN ELECTRICITY BOARD

Second Assistant Chief Engineers

APPLICATIONS are invited from suitably qualified engineers for two posts as SECOND ASSISTANT CHIEF ENGINEERS at the Board's Headquarters, Cheetwood Road, Manchester, 8.

The successful applicants will be responsible to the Assistant Chief Engineer (Planning and Design) and duties will include long-term planning, system development, design and the construction of major substations.

Salary will be in accordance with Grade 4 of the N.J.M. Scales (£1,825 to £1,975) (subject to revision).

Applications, giving names of three referees, must be sent to the Secretary, North Western Electricity Board, Cheetwood Rd., Manchester, 8, so as to be received not later than Monday, 26th August, 1957. 6971

THE LANCASHIRE DYNAMO GROUP

CHIEF ENGINEER AND MANAGER, SWITCHGEAR DIVISION,

required at their Oxted, Surrey, works to carry out an extensive re-design and development programme covering automatic control gear and allied products.

This appointment carries an attractive salary, with a good pension, and offers excellent prospects in a virile organisation situated in a Surrey beauty spot twenty-four miles from London with housing available.

Applications, which will be treated in confidence, should give full details of age, qualifications, experience and salary required, and should be addressed to :—

Managing Director
LANCASHIRE DYNAMO NEVELIN LTD.
Hurst Green, Oxted, Surrey
7083

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the Transmission Department at Divisional Headquarters. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 5, £810 to £935, ultimately rising to £1,035 per annum.

Candidates should possess Higher National Certificate in Electrical Engineering or an equivalent qualification, and should have had some experience of high-voltage transmission lines and substations.

Apply on form AE6, quoting vacancy number 614MD, available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 4th September, 1957. 7077

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Shakespeare Street, Nottingham

APPLICATIONS are invited for the post of ASSISTANT GRADE B IN LIGHT CURRENT ELECTRICAL ENGINEERING.

Salary in accordance with the Burnham Technical Scale as follows: £650 × £25 to £1,025 per annum. Additions include degree allowance of £75 per annum (or £125 for good honours degree), up to 3 increments of £25 for training in approved cases, and incremental allowance for industrial experience after age 21, and war service.

Further particulars and form of application may be obtained from the Principal. Completed forms should be returned not later than 14th September, 1957. 7024

CENTRAL ELECTRICITY AUTHORITY

South Wales Division
Vacancy No. 131/57

APPLICATIONS invited for superannuable N.J.B. appointment of STATION SHIFT CONTROL ENGINEER, LLYNFI POWER STATION, ABERKENFIG, Nr. BRIDGEND.

Salary G.10 (£790 to £835 per annum.

H.N.C. or equivalent qualification desirable.

Application forms obtainable from the Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 29th August, 1957. 7092

A MECHANICAL engineer of not less than Higher National Certificate standard, with some electrical knowledge, required in the West Midlands for interesting work in connection with accessories and power sources for automatic and manual arc welding. The post is pensionable and offers good prospects to a keen engineer capable of working on his own initiative. Salary range £700 to £900, according to age, experience and qualifications. Apply giving full particulars to—Box 7084.

A NORTH Wales electrical engineering firm requires the services of an electrical engineer with experience in the design, development and manufacture of high-quality paper condensers. Apply in confidence stating age, experience and salary required.—Box 7035.

A SALES executive is required by a middle-sized company manufacturing plastic cables and allied products. The post offers scope for a man with a good education, connection in the cable trade, ability to control sales staff and ability to promote sales. A man aged between 30 and 40 years is preferable. The post carries a good salary.—Box 7034.

ASSISTANT electrical engineer required by large firm of building and civil engineering contractors for the preparation of contract documents and specifications for installations in flats, schools, offices and factories, etc., and to deal with sub-contractors through all stages. Permanent appointment, 5-day week, in head office, London. Salary commensurate with experience and ability; pension fund after a probationary period. Write — Box No. 1072, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4. 7067

ASSISTANT manager required for expanding transformer department. Must be capable of designing most types of transformers up to 250 kVA. Good prospects for the right man. Annual bonus scheme.—Austin Walters & Son Ltd., Ayres Road, Trafford, Manchester, 16. 6940

ASSISTANT storekeeper, age 20-25, experienced in electrical wholesale trade, large wholesalers in East London area. Write stating experience and salary required.—Box 7047.

ASSISTANT technical engineer required by prominent East London company engaged in the production of winding wires. Qualifications, degree in electrical or mechanical engineering or corporate membership of relevant professional institution. Please write to Personnel Officer.—Box 7036.

BRANCH manager required by electrical wholesaler in the Midlands. Applicants must have had administration and sales experience. Opportunities for advancement. Remuneration by salary, commission and expenses. Car provided. Superannuation scheme operative. —Box 7086.

CIRCUIT draughtsmen required by firm manufacturing industrial control equipment. Commencing salaries up to £800 per annum for first-class men, but some less experienced draughtsmen required. Canteen facilities, pension scheme, holiday commitments recognised. Housing assistance later to approved cases. West Middlesex area. Write giving age, experience and full details to Box 7125.

DRAUGHTSMAN wanted — electrical experience an advantage. Opportunity for ambitious man in Westminster office. Write age, experience and salary required. —Box 7126.

EDMUNDSONS CONSTRUCTION Co. Ltd. have a vacancy for a contracts engineer in their London office. Good prospects in expanding business. Superannuation scheme. Reply stating age, experience and salary required to the Area Manager at 24/30, Gillingham St., London, S.W.1. 6979

ELECTRICAL contractors (Central London) require experienced estimator supervisor. No Saturdays. Superannuation scheme. Write in confidence stating experience and salary required.—Box 7037.

ELECTRICAL contractors, North-West Kent area, require services of a part-time or free-lance estimator, experienced in general lighting, power and heating systems. All enquiries treated with strict confidence.—Box 9061.

ELECTRICAL contractors require experienced estimator for industrial power and lighting contracts. Young man, 25-35, capable of working on own initiative. Please reply in confidence, giving age, experience and salary required, to Electric House (Denton) Ltd., Law Street, Denton, Manchester. 7069

ELECTRICAL draughtsmen required immediately by consulting engineers in centre of Manchester for designing installations for medium-voltage distribution, lighting and power for Government buildings. Temporary engagement for at least six months with possibility of permanent position. Salaries up to £850 per annum. State age, qualifications and experience to—Box 7048.

ELECTRICAL engineering draughtsman required with some experience in the preparation of schemes for M.V. electrical distribution and illumination and electrical equipment of industrial buildings. Minimum technical qualification O.N.C. Minimum starting salary for draughtsman of H.N.C. standard is £747 p.a. at 25. Salary reviewed annually. Conditions include a contributory pension scheme, assistance with house purchase, family education schemes, a wide variety of recreational facilities, etc. Apply stating age, qualifications and experience to the Personnel Officer, Pilkington Brothers Limited, Cowley Hill Works, St. Helens, Lancashire. 7033

ELECTRICAL engineers for junior posts are required for experimental work on traction auxiliary motors and electro-pneumatic control schemes and equipment. There are possibilities of advancement for those who have obtained O.N.C. or reached S2 standard, and had some practical experience. Age limit 26. Write for further details to Personnel Superintendent, Westinghouse Brake & Signal Co., Ltd., Chippenham, Wilts, quoting ref. no. EQUIP/N/A1. 7127

ELECTRICAL. First-class engineers, foremen and chargehands required by large London firm electrical engineers and contractors. Progressive positions. Write age, experience, references, etc.—Box 7068.

ELECTRICAL sales engineer, aged 23 to 30, required in export department (London) of well-known manufacturers of electric motor starting and control gear. Position offers scope, good salary, prospects, and is pensionable. Write stating age, present salary and experience. —Box 6880.

ELECTRICAL wholesaler requires branch manager in the West Country. Applicants must have had considerable experience in a similar position. Opportunities for advancement. Remuneration by salary, commission and expenses. Car provided. Superannuation scheme operative.—Box 7085.

ELECTRICIAN for N.W. London electrical retail and contracting business of good standing. Good prospecst for capable man with high standards of service; able to drive. State age and details of career.—Box 9079.

ELECTRICIAN wanted, with good all-round experience in electrical repairs and installations. Apply—W. J. Lee Ltd., 197a, Brompton Road, London, S.W.3. 9067

ELECTRICIANS, London rates.—Leonard J. Ive, 29, Clarendon Road, Watford (Phone 4030). 9070

ENGINEER required by electrical engineers in N.W. London. Applications are invited from men who possess experience in electric motor drives and control equipment, able to take charge of small design and drawing office, and capable of preparing good quality drawings. Familiarity with printing trade requirements essential.—Box 7049.

ENGINEERS are required for a manufacturing company in Johannesburg. (1) Switchgear engineer with sound background of protection schemes for development work on distribution at present up to 11 kV. (2) Control gear engineer with sound experience in design and application of motor control gear 1 to 2,000 H.P. The work is interesting and varied involving pre-estimate design and contracts engineering of switchgear projects. Previous experience required. Positions are permanent and pensionable, offering good prospects, good starting salary and excellent working conditions. (3) Engineer with commercial experience for preparation and submission of estimates and handling of contracts connected with manufacturing and selling of motors. Position is a senior one with commensurate salary and is pensionable. Applicants should state age and full details of experience and when at liberty to travel. Reply to—Box 7129.

EXPERIENCED meter designer required by Chamberlain & Hookham Ltd., Birmingham, 5. Written applications giving all details of electrical and mechanical design experience, age and technical status will receive careful consideration. An appropriate offer will be made to suitable candidates. 9066

ENGINEER surveyor for inspection of cranes and other lifting plant required. East Midlands and South Wales areas. Must have drawing office experience of design of cranes, also National Certificate for Mechanical Engineering. Salary £735 to £1,060 (E.S.A. scale). Non-contributory pension, etc. Apply—Manager, Engineering Dept., General Accident Corp. Ltd. 99, Aldwych, London, W.C.2. 7128

FOREMAN electricians required by contractors in London W.C.2 area. Works in Greater London. Good prospects and superannuation scheme available for right men. All applicants will be interviewed.—Box 9065.

IMPERIAL CHEMICAL INDUSTRIES Limited, Plastics Division, has an immediate vacancy for an electrical draughtsman in the Chief Engineer's Department at Welwyn Garden City. Candidates must have served a recognised apprenticeship and should hold the Ordinary National Certificate. Experience of factory and general industrial installation work would be useful. An attractive starting salary will be offered to the selected applicant, beyond which there is plenty of scope for progressive remuneration. The appointment carries membership of the staff pension fund and a profit-sharing scheme is in operation. For married men special mortgage facilities can be granted towards house purchase, and assistance is given towards removal expenses. Temporary lodging allowance also available for married men. Apply giving full particulars to the Staff Manager, Imperial Chemical Industries Limited, Plastics Division, Black Fan Road, Welwyn Garden City, Herts. 7087

OPPORTUNITY for keen man (about 30) to take charge of sales office of old-established London firm in lighting industry. Experience in lighting fittings sales activities desirable but not essential. Applicants must have good knowledge of the electrical trade and be accustomed to dealing with users, contractors, architects, etc. Good prospects for keen organiser. 5-day week; pension fund. Write fully, stating age, experience and salary range.—Box 6964.

REPRESENTATIVES required with connections with contractors, architects, etc., to sell electric heating system as additional line. State area covered and lines already carried.—Box 7130.

SALES engineer with experience of motors and generators up to 1,000 h.p. or kVA. Progressive post with excellent prospects and pension scheme. Full details of age, education, training and experience to—Box 7050.

SALES representative required for Northern area (Manchester, Lancashire, Yorkshire, etc.) by manufacturers of scientific and electrical instruments. Candidates should have a background of electrical experience. H.N.C. preferred, together with sales experience. Established contacts in all branches of industry in the area will be advantageous. The company offer first-class salary and conditions of employment, together with superannuation and life assurance scheme. Initial applications should contain full academic background together with a summary of posts held to date.—Box 6996.

SHIFT charge engineers required for the Baghdad Electricity Services. Experience in medium-pressure oil-fired boilers, turbo-generators up to 15 MW, electrical control gear, 11-kV and L.T. power house auxiliaries. Monthly salary ID.110 plus high cost of living. Provident fund exists. House accommodation with heavy furniture or house allowance. Three-year contract. Three months' home leave on full pay after two consecutive summers in Iraq. Age limit 36.—Box 6997.

SITUATION available for senior switchgear designer experienced in the general mechanical and electrical design work associated with high-power switchgear and circuit breakers up to 132 kV. Previous experience on the lines indicated preferable, but design experience on associated equipment will be considered. Applications giving age, education and full details of experience, together with salary required, to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 7088

SOUTH WALES SWITCHGEAR Ltd., Blackwood, Mon., have vacancies for experienced draughtsmen required to undertake application design work in connection with 11-kV and 33-kV metalclad switchgear contracts. Applicants should preferably hold a Higher National Certificate and should have good experience of switchgear manufacturing and design technique. Applications giving full particulars of age, experience and education to the Personnel Manager. 6959

Situations Vacant (continued)

SENIOR draughtsman with first-class design experience in switchgear, overhead and sub-station equipment to take charge of D.O. H.N.C. or equivalent desirable but not essential. Salary commensurate with experience and quaifications. Write stating age, education, qualifications and experience to—The General Manager, Electric Transmission Ltd., Newstead, Trentham, Stoke-on-Trent, Staffs. 7051

SOUTH WALES SWITCHGEAR Ltd. have vacancies for assistant engineers in their expanding organisation, to assist in the design and manufacture of electrical switchgear and transformers. Applications are required from men carrying a Diploma or Higher National Certificate, who have already received training in mechanical or electrical engineering. Applications should be sent to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon, giving details of age and training. 7014

STOCK control operator and order clerk required. Both posts are senior, well-paid positions offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to Managing Director, Halsey's Electric Co. Ltd., Brandon House, Wyfold Rd., London, S.W.6 (Fulham 3355). 7052

STOREKEEPER for switchgear and conduit fittings, preferably able to drive. Good wages and excellent prospects for keen man. Write or phone—Leslie Maynard Ltd., 306a, Fulham Road, London, S.W.10 (Flaxman 3526). 158

SUPERVISING engineer with estimating experience required by electrical contractors. 5-day week and superannuation scheme. Apply in writing stating experience and salary required. —Marryat & Place Ltd., 40, Hatton Garden, London, E.C.1. 7038

SWITCHGEAR sales engineers required, preferably with H.N.C. or higher qualifications and with experience in tendering for E.H.V. switchgear installations and power station auxiliary applications. Applications to give age, education and full details of experience, together with salary required, to—Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 7089

TECHNICAL assistant required by expanding electrical manufacturers in Redditch to assist with estimates and contracts. Higher National Certificate or Graduate I.E.E. preferred but not essential. Excellent prospects and pension scheme. Write stating age, qualifications, experience and salary required to—Box 6890.

TECHNICAL assistant required for work on projects involving very heavy current transmission. Candidates should have Higher National Certificate and preferably some experience in design work involving simple structural arrangements. Five-day week. Pension fund. Canteen. Applications in writing to—Personnel Officer, British Insulated Callender's Cables Limited, Surrey House, Temple Place, London, W.C.2 (reference L.15). 7073

TECHNICAL sales engineer (junior) preferably studying for H.N.C. (Telecoms) required. An interesting position coupled with excellent prospects is open to a keen and intelligent engineer. Knowledge of relays an asset. Staff canteen. Write giving full details of education, experience, etc., to—Personnel Manager, Telephone Manufacturing Co. Ltd., Martell Rd. West Dulwich, London S.E.21. 7138

TECHNICAL sales representative for Greater London and Home Counties. Generous salary/commission/expenses. Must own car. Pension scheme, 5-day week. Only applicants with experience, initiative and dynamic personality will be considered. Full details to—Man. Dir., British Central Electrical Co. Ltd., 6, Rosebery Avenue, London, E.C.1. 7131

VACANCIES exist for first-class switchgear engineers for design and application of automatic control gear and L.T. switch fuseboards in the engineering and development departments of old-established electrical company at their Surrey works. Housing available, pension fund, great opportunities for young men with initiative and drive.—Box 7082.

WORKS manager to take complete control of manufacture of medium-sized electrical rotating equipment. Applicants (30/45) should be well versed with modern manufacturing processes, have drive, enthusiasm and preferably experience in manufacture of electrical apparatus. Write in confidence giving full details of experience, salary required and age.—Box 6956.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A.M.I.E.E. (42), wide knowledge industrial installation, good technical background, seeks position assistant electrical engineer or technical sales. Other offers welcomed. Not London.—Box 9080.

CABLE jointer seeks position in London or Nth. Kent area. Experienced up to 33 kV, also used to live work.—Box 9057.

CHARTERED electrical and mechanical engineer with 18 years' executive experience out East desires position as overseas representative, travelling representative, export manager or contracts manager. Available early September.—Box 9068.

ENGINEER, M.I.E.E., retired (55), desires appointment. Managerial, personnel, welfare or technical representative. Background, works engineer large industrial concern/work study administration 8 years. Dorset or adjoining counties desirable.—Box 9082.

ENGINEER (36), M.T.T.I., recently returned from Australia, requires situation. Twenty years' extensive field service and repair shop experience in fault location, rewinding, redesign and repair of all types rotating electrical machinery and associated equipment.—Box 9064.

EXECUTIVE engineer, B.Sc. (37), 11 yrs. experience all aspects contracting, seeks position of responsibility in technical/commercial capacity.—Box 9081.

FOREMAN/supervisor (37), experience overseas contracting large building installations, H.V./L.V. distribution, desires further overseas employment.—Box 9062.

QUALIFIED elect./mech. engineer (47). Experienced chief engr. and works manager. Rotary machy., swgr., elect. appliances, fabrication, foundry. Pres. loc. Essex/London. —Box 9075.

SALES engineer, long experience in domestic apparatus, seeks position in Scotland or N.E. England. Managerial position at present time on salary of £1,350 p.a.—Box 9076.

SERVICE engineer, proficient in telephone and clock equipment, at present residing in Northants, requires post in Northants or Leicestershire. Willing learn other equipment. —Box 9073.

ARTICLES FOR SALE

LARGE A.C. MOTORS

3-phase, 50 cycles

Maker.	h.p.	Volts.	r.p.m.
B.T.H.	1820	3.3 kV	368
B.T.H.	1800	400/440	368
B.T.H.	1400	6.6 kV	368
L.D.M.	900	3.3 kV	485
L.D.M.	900	400/440	485
L.D.M.	750	6.6 kV	485
MATHER & P.	350	400/440	730
E.C.C.	300	400/440	580
MATHER & P.	300	400/440	750
B.T.H.	275	400/440	485
B.T.H.	250	400/440	480
BRUSH	250	400/440	420
E.C.C.	175	400/440	580

Reconditioned and guaranteed.

THOS. W. WARD LTD.
Albion Works, Sheffield
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UNUSED D.C. GENERATORS
(for Prompt Despatch)

QUANTITY of 24-kW and 15-kW compound wound 100-volt D.C. Generators by L.D.C., E.C.C. and E.E.C.; drip-proof frames with endshield ball/roller bearings; various speeds between 1,440 and 1,625 r.p.m.

30-kW compound wound D.C. generators by MAWDSLEY, drip-proof frames; 1,100 r.p.m.; with endshield ball/roller bearings; 230 volts.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 7039

USED ELECTRICAL EQUIPMENT FOR SALE

Inspection by Arrangement

ONE E.E.C. 25-h.p. S.R. Motor, 400/440 v., 3-ph., 960 r.p.m., size AG.53. £80
One ELLISON 25-h.p. Face Plate S.R. Starter, £42 10s.
One ELLISON 25-h.p. Face Plate Starter, 415 v., 3-ph., rotor amps. 99. £42 10s.
One pair Slide Rails. £3 10s.
One ENGLISH ELECTRIC 25-h.p. Motor and Base Plate, 400/440 v., 960 r.p.m., rotor amps. 112, size Z.653. £80.
One ENGLISH ELECTRIC 16-h.p. Motor, 400/440 v., 3-ph., 960 r.p.m. £39.
One CROMPTON 15-h.p. S.C. Motor, 400/440 v., 3-ph., 2,900 r.p.m. £25.
Two ENGLISH ELECTRIC 15-h.p. Motors, 400/440 v., 3-ph., 710 r.p.m., rotor amps. 107, size AGS.2. £70 each.
One ALLEN WEST 15-h.p. S.R. Motor Starter, type S.R.13, 400/440 v. (oil bath). £36.
One CROMPTON 10-h.p. S.C. Motor, 400/440 v., 3-ph., 710 r.p.m. £29 10s.
One B.TH. 7½-h.p. S.C. Motor, 400/440 v., 3-ph., 1,450 r.p.m. £15 10s.
One Crompton 4-h.p. Motor, 400/440 v., 3-ph., 1,430 r.p.m. £11 10s.
One CROMPTON 4-h.p. "Klosd" Motor, 400/440 v., 3-ph., 1,430 r.p.m. £13 10s.
One BULL S.R. Motor, variable speed, 1/3-h.p., 900/650 r.p.m. £36.
Variable Speed Starter for above by BROOKHIRST. £15.
One LAURENCE SCOTT 1-h.p. Motor, 400/440 v., 3-ph., 960 r.p.m., totally enclosed. £10 10s.
One CROMPTON ¾-h.p. "Minor" Motor, 240 v., 1-ph. £9.
One B.T.H. ½-h.p. Flameproof Motor, 400/440 v., 3-ph., 568 r.p.m. £30.
Six NECO ½-h.p. Motors, 400/440 v., 1,400 r.p.m., totally enclosed. £5 each.
Two BROOK ½-h.p. Motors, 400/440 v., 1,430 r.p.m., totally enclosed. £4 10s. each.
One 4-h.p. Geared Motor Unit, 400/440 v., 50 cy., 3-ph., ratio 1,460/685, but fitted with 960-r.p.m. motor instead of original 1,460-r.p.m. £35.
One IGRANIC Reversing Starter for above. £11.
One American ½-h.p. Geared Unit with E. brake, 3-ph., 1,460/104/1 ratio. £19.
One LAURENCE SCOTT Geared Unit, 1/16 h.p., 400/440 v., 3-ph., 23 r.p.m. £22.
Two ELLISON 15-h.p. Face Plate Starters, 400/440 v., 3-ph., rotor amps. 107. £36 each.
One B.T.H. Star-Delta Starter, 5 h.p., 400/440 £7 10s.
One CROMPTON Motor Generator Set on base plate, 220 v. D.C., 500 watts output. £30.

Enquiries please to—Box 7135.

SURPLUS ALTERNATORS FOR SALE

ONE 50-kW D.C./A.C. Motor Alternator, 415 v., three-phase, four-wire, 50-cycle alternator driven by a 420-v. D.C. motor. The motor and alternator are mounted on a common bedplate and are complete with a motor starter and alternator control panel. Various spares.

Year of manufacture, 1949.

Manufacturer, BRUSH ELECTRICAL ENGINEERING Co. Ltd., Loughborough.

Full specifications are available.

One 50-kW A.C. Diesel Alternator. Engine 90 h.p. Alternator 50 kW at .8 power factor, 1,000 or 1,200 r.p.m. Model No. 6016E. Running hours to date 6,900.

This is a two-stroke diesel alternator mounted on a self-contained bedplate complete with control panel as an integral part of the machine. This machine was installed in 1947 and has been used mainly for standby purposes. Regularly serviced by the manufacturers, and has only done 63 hours since it was completely overhauled.

Manufacturer, GENERAL MOTORS Ltd., Detroit.

Inspection can be arranged upon application to the Purchasing Officer or his Assistant.

ARTHUR GUINNESS, SON & CO. (PARK ROYAL) LTD.
Park Royal Brewery, London, N.W.10
7091

D.C. MOTORS FOR PROMPT DELIVERY

H.P.	Volts.	Make.	Speed.
250	550	HARLAND	1600
225	250	HARLAND	1450
175	525	E.C.C.	1500
110	220	L.D.C.	1450
80	220	L.S.E.	1450
57	220	G.E.C.	850
55	550	C. PARK.	1150
40	220	L.S.E.	1750
33	550	ALLEN	900

D.C. Motors available between 1-500 h.p.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241) 6962

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

SOUTH WALES SWITCHGEAR DISTRIBUTION EQUIPMENT

SWITCHBOARD, 440/3/50, comprising :—

1 1,500-amp. Circuit Breaker.
2 1,200-amp. Circuit Breakers.
1 800-amp. Circuit Breaker.
8 600-amp. Circuit Breakers.

Date 1941 ; horiz. isolation ; each breaker has a shunt trip coil and separate panel carrying ammeter, earth fault and overcurrent relays. Condition as new.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
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A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co., Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/- Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALUMINIUM, brass and copper in sheets, rods, tubes, angles, etc. Sheared blanks a speciality. Approved stockholders. For immediate attention, phone or send your inquiries—R.D.C., 100, Hamstead Rd., London. N.W.1 (EUSton 5176/7). 352

AUTO transformer starters, all 400-440/3/50, oil immersed; 150 h.p., Allen West; 4 off 95 h.p., Erskine Heap; 75 h.p., Allen West; 60 h.p., A. West; 50 h.p., Metro-Vick.; 65½ amp., Ellison; 50 h.p., Ellison; 45 h.p., A. West; 49½ amp., Ellison; 40 h.p., A. West; 3 off 44 amp., Ellison; 27 h.p., A. West; 3 off 15 h.p., Erskine Heap.—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley (3774/5/6). 68

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring. Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

ELLISON bantam oil imm'd circuit breakers and star delta starters. Quantity, cheap. —J. S. Ramsbottom & Co. Ltd., Keighley 3774/5/6. 7133

FANS, desk and ceiling type, D.C., all voltages and sizes in stock. — Universal Electrical, 221, City Road, London, E.C.1. 6837

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues.—The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR sale : 3 new and unused power factor improvement 100-kVA capacitors, type L.86, oil filled to B.S.1650, 1,906 kV, single-phase, 50 cycles, fitted with two outdoor shedded pattern high-voltage bushings, housed in boiler plate tank mounted on skids. Manufactured by A. H. Hunt (Capacitors) Ltd., Box No. 1054, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4. 6999

FRACTIONAL h.p. motors, new, ex stock. A.C./D.C., Universal, B.T.H., Delco-Remy. G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London. E.C.1. 126

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

GEORGE Ellison oil-immersed auto-transformer starter, 250 h.p., 400 volts, 3-ph., 50 cycles.—Whitefield Machinery & Plant Ltd., Cobden St., Salford, 6 (Tel. PEN. 4746). 305

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d.—Universal Electrical, 217-221, City Road, London, E.C.1. 37

LIFT unit, 1 cwt., o/head, 400 v., push-button, post-war, by Hammond & Champness. Price £35. Can be seen at—111, West Ealing Broadway, London, W.13 (10-5) (Ealing 2963). 7139

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit breakers. Large stock of all types, ¼ to 300 h.p., new or reconditioned, for immediate delivery. Stock list or quot'n by return.—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

REPULSION induction motors, new and unused, all 1,430 r.p.m.; 8 off 3 h.p., Hopkinson, 220/230 v., £20 ea.; 12 off 3 h.p., Higgs, 220/440 v., £20 ea.; 1 off 2 h.p., Brush, 230/250 v., £17; 12 off 1 h.p., Higgs, 230/250 v., £14 ea. Reduction for quantities—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley 3774/5/6. 7132

ROTARY converter by Browning's Electric. Input 460 v. D.C., output 20 kVA, 400 v., 50 cycles, 3-phase, 28.9 amps. Price £110.—Aircraft Production Tooling Co., 5, Barnett Wood Lane, Leatherhead, Surrey (Phone, Leatherhead 3596/7). 9072

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

SMALL BA screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

STEAM boiler for sale. One Bouellat B-type boiler, size 100/B.S. 4600/36, having an evaporation of 5,930 lb. hr., W.P. 100 p.s.i., arranged for oil firing with Hamworthy rotary cup burner. An important feature is high output for small floor area. This is a new boiler now ready for delivery, but not required by buyers owing to change in policy.—Box 7070.

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TRANSFORMER welder by English Electric, 36 kVA, 360/600 amps.—Thomas Mitchell & Sons Limited, Bolton. 7040

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

6 AUTO stator/rotor starters with integral isolators for 3-p., 400 v., being 5 Dewhurst type SRI-B 15 h.p. and one Igranic type 1080 50 h.p. Offers. Write—Howse Bros., 8, Hillrise, Brands Hill, Slough, Bucks. 9078

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

Articles for Sale (continued)

885 new storage cells for sale, heavy duty, 570 amps., ebonite container and sealed covers. Orig. made for Admiralty, packed 4 per wood case for transit. Low price for quantities. — Burleigh Alpine Works, Empire Way, Wembley (Tel. 0211). 324

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return.—Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

BRADLEY Redundant Electricals, 74, Eversleigh Rd., London, E.6 (Phone GRA. 2750). London leading clearing house for all redundant electrical stock and equipment, A.C. and D.C. motors, generating plants, welders and diesel sets. Complete factories bought and dismantled if required, also small or large stocks of scrap cable (dismantled if required). Estimates given. 185

CABLE, surplus, wanted. Large quantities single P.V.C. and V.I.R., 1/.044" up to 19/.083" and larger. Also steel/P.V.C. assault wire, and telephone wire.—Box 7090.

HARRINGTON & SONS, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

SURPLUS stocks of all types of domestic electric appliances wanted for prompt cash. Large funds available.—Spears, 14, Watling St., Shudehill, Manchester (Phone, Blackfriars 1916) (Bankers, Midland Bank Ltd.). 338

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WANTED. 1½/2 kW diesel lighting plant for keeper's cottage.—Wylie, Old Rectory, Carlton, Newmarket. 9074

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

SPARE-time electro-mechanical drafting effort available, North London area.—Box 9069.

SUB-assembly work invited by specialising company. Excellent capacity for longish runs. Increased output for you at reduced costs. —Box 7002.

TRANSFERS and display cards made to customers' requirements at competitive prices. — Ashfield Screen Printing Ltd., Borrowash, Derby. 9045

AGENCIES

ELECTRIC blankets. Would former agents of Warmalux or Thermex kindly write Box 9077.

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MANUFACTURERS of quality fluorescent fittings, tubes, starters and control gear wish to contact quantity buyers, wholesalers, agents, etc., interested in purchasing in quantity at special low prices. Advertisers are interested in long or short term arrangements.—Box 213.

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WORKING partner wanted for electrical wholesale ltd. co., 10 miles London, Middx/Surrey area, just becoming established. —Box 9071.

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LEARN electrical engineering the practical way. Our new self-study course includes equipment on which experimental work can be carried out. Also courses for all professional examinations. Free brochure from E.M.I. Institutes. Dept. ER57, London, W.4 (Associated with H.M.V.). 318

WORK study. Part-time (evening) 20-week diploma course starts 9th Sept. Enrolments open now. Details of this and 5 other courses, including full-time (6 weeks) and correspondence, from — School of Time & Motion Study, 29, Cork Street, London, W.1 (REGent 0516). 6786

COMPANY MEETINGS

HACKBRIDGE AND HEWITTIC ELECTRIC

Record Intake of Orders

THE 51st Annual General Meeting of Hackbridge and Hewittic Electric Company Limited was held on 8th August in London, Mr. Anthony M. Browne (chairman and managing director) presiding.

The following is an extract from his circulated statement :—

Although output of the company's products during the year under review has been maintained at about the same figure as each of the two previous years, the trading surplus for the year ending 31st March, 1957, amounts to £439,663, against £534,079 for the previous year.

This fall in the company's profits has been due mainly to unavoidable increases in costs of wages and materials at a time when prices for the finished products have not risen correspondingly and indeed in some cases have actually fallen.

It is a trend we have endeavoured to overcome or at least minimise by improving designs and manufacturing facilities.

Benefits from this capital expenditure and development work carried out have to a considerable extent helped to offset the reduced profit margins, and we hope that the benefits will increase during the coming year, when the increased manufacturing facilities will be available throughout the whole manufacturing period.

The net profit of the Group, before taxation, amounts to £341,911, against £461,957 for the previous year. After taxation of £196,800 (as against £244,428 the previous year) there is available a net profit of £145,111, as against £217,529.

Orders have been received at a good rate during the year. In fact, this has been a record year from this point of view and the company has orders in hand to a value of 30% in excess of the corresponding figure twelve months ago. We feel, therefore, that we have the work in hand and facilities in the factory to achieve successful results during the coming year provided, of course, that no serious interruptions occur, and that a reasonable stability in the rate of wages and costs of materials is maintained.

The Directors recommend the transfer of £50,000 to General Reserve (as compared to £100,000 the previous year) and the payment of a final dividend of 15%, making a total of 20% on the present ordinary capital of £750,000.

Transformer and Rectifier Divisions

The company has continued generally to supply its products to its traditional clients. At home the Central Electricity Authority and Area Boards have been the main purchasers of transformers, and your company have supplied them with transformers covering all the range of units wanted by them, including some of the largest size machines for the Super Grid operating at 275,000 volts.

These transformers are larger than any previously made by your company (120,000 kVA, total weight of each 260 tons). It is confidently hoped that we shall receive a considerable amount of such work in the future and already other orders in this range have been received.

It is also of interest to note that the ratio of orders for larger transformers has been increased and that normal proportion of export business has been maintained.

In the Rectifier Division the contract for rectifiers for the frequency change-over programme of the Southern Region of the British Railways, which was started in 1952, was completed during this year. It has given every satisfaction and the British Railways have since placed a contract for similar plant for extension to the Southern Region network entailing 31 new substations with a total capacity of 80,000 kW.

We have also during the year supplied more plant for the London Transport Executive, including the plant for the largest glass bulb rectifier substation in their system at Charing Cross (9,000 kW now, later to be increased to 12,000 kW), and, as usual, a large number of equipments to the Admiralty. The value of exports in this division of your company has been as high as 60%, mostly to the U.S.A., Canada, India and Australia.

I have already mentioned that a record intake of orders has been received during the year, and this has been the case in each of the company's normal products—transformers, mercury arc rectifiers and switchgear—and, therefore, full working in each division is assured for all of the coming year and more.

The report was adopted. 7018

CLASSIFIED ADVERTISEMENTS ARE PREPAID

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By Robert A. Harvey, B.Sc.(Eng.), M.I.E.E.

This invaluable book shows how the problems of battery charging and control have been solved in many diffierent industries. It enables the engineer to examine the schemes used in other fields and to select and adapt such schemes for his own particular use.

Covers every important battery control scheme

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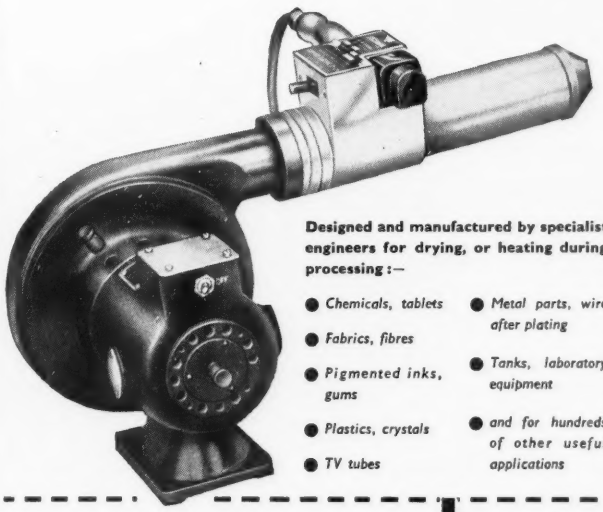

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Secomak REG'D

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In addition to the range of standard units for permanent installation, portable units are also available. Both types cover a wide range of capacities and temperatures up to 700°F. Data sheet 130/53 illustrates applications of the units and gives full information concerning air volume and temperature ranges — write for it now.

Any of the large range of standard hot air blowers we manufacture can be adapted to your own requirements and built into your own machinery.

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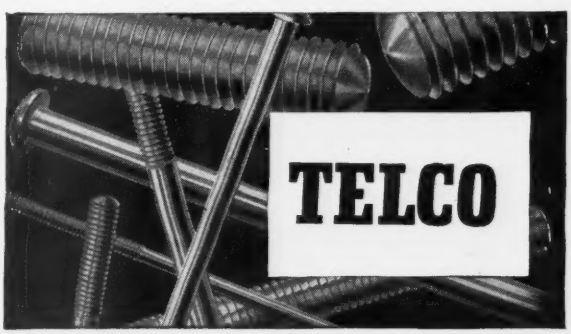

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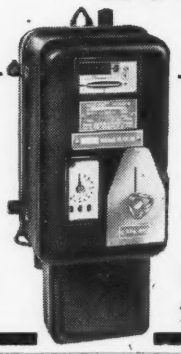

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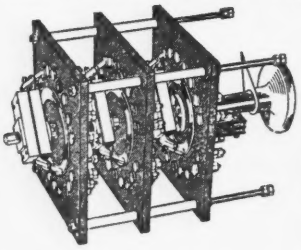

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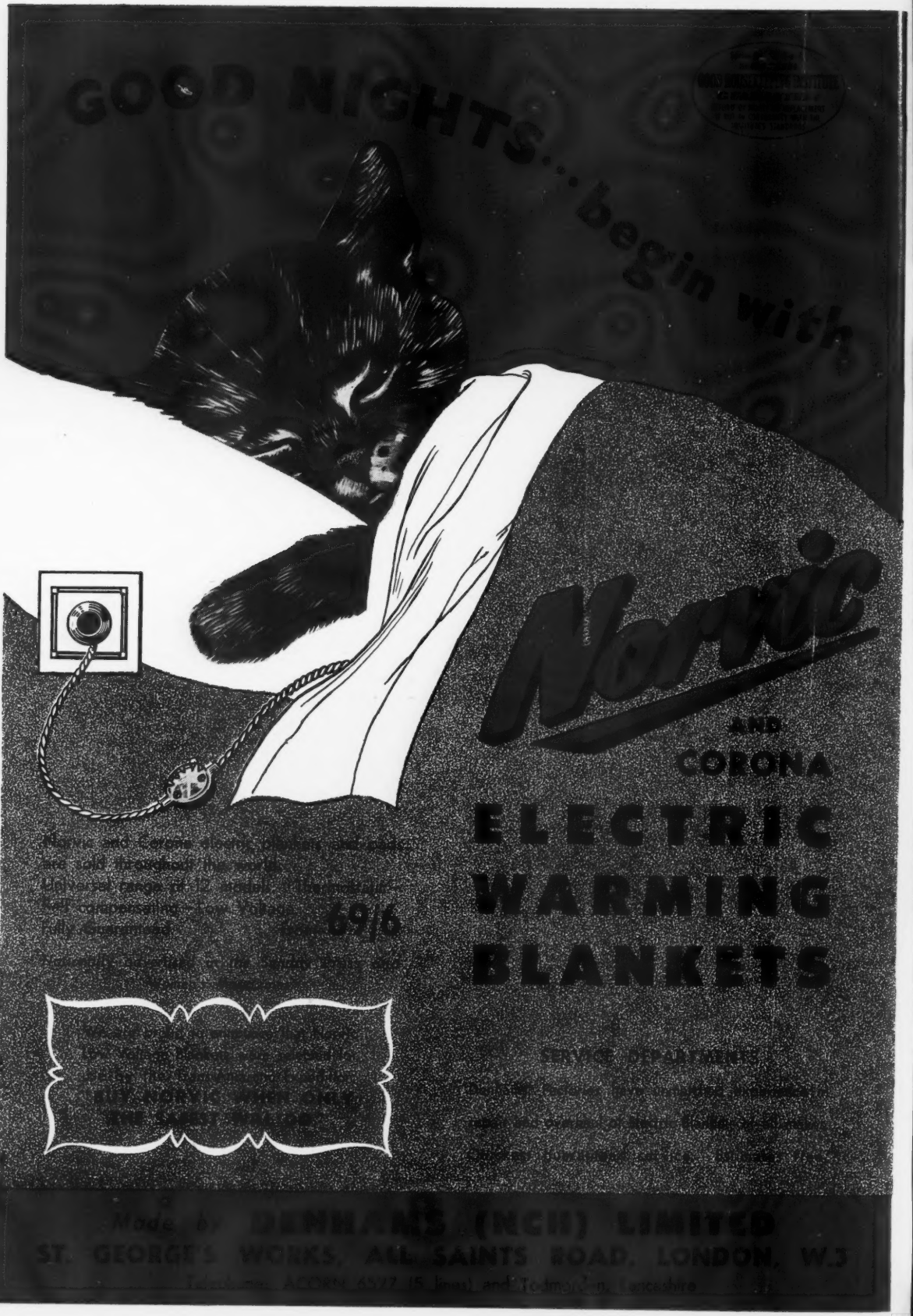
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